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HYDROLOGIC POTENTIAL FOR HYALITE CREEK WATERSHED

Prepared For :

Montana Department of Natural Resources and Conservation
32 South Ewing
Helena, MT

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TABLE OF CONTENTS

TABLE OF CONTENTS

<u>ITEM</u>	<u>PAGE</u>
Table of Contents	i
List of Figures and Tables	ii
SUMMARY AND CONCLUSIONS	1
INTRODUCTION	3
PROJECT DESCRIPTION	4
Location	4
Physiography and Watershed Characteristics	4
Climate	6
Hydrology	7
BASELINE DATA	10
Streamflow Data	10
Climate Data	10
Snow Data	11
TECHNICAL ANALYSES	12
Study Period	12
Streamflow Hydrology	20
Hyalite Creek at Hyalite Ranger Station	20
Hyalite Creek at Middle Creek Dam	23
REFERENCES	27
BIBLIOGRAPHY	28
APPENDIX	
Figures	
Tables	

LIST OF FIGURES AND TABLES

FIGURES

- | | | |
|-----------|---|---|
| Figure 1 | - | Vicinity Map |
| Figure 2 | - | Location Map |
| Figure 3 | - | Drainage Area Map |
| Figure 4 | - | East Fork of Hyalite Creek Stream Profile |
| Figure 5 | - | West Fork of Hyalite Creek Stream Profile |
| Figure 6 | - | 1979 Climatic and Hydrologic Data |
| Figure 7 | - | Cumulative Surplus/Deficit Curve, Extended
Hebgen Dam Precipitation: 1889-1982 |
| Figure 8 | - | Cumulative Surplus Deficit Curve, Hebgen Dam
Precipitation: 1931-1982 |
| Figure 9 | - | Cumulative Surplus/Deficit Curve, Hebgen Dam
Precipitation: 1937-1982 |
| Figure 10 | - | Annual Precipitation Plot, Extended Hebgen
Dam Precipitation: 1889-1982 |

LIST OF FIGURES AND TABLES (continued)

TABLES

Table 1	-	Drainage Area Summary
Table 2	-	Area-Altitude Summary for Middle Creek Dam Watershed
Table 3	-	Streamgage Index
Table 4	-	Monthly Streamflows for Hyalite Creek at Hyalite Ranger Station (Historic Records, Total Record Period)
Table 5	-	Monthly Streamflows for Hyalite Creek at Hyalite Ranger Station (Unregulated Flows, Total Record Period)
Table 6	-	Monthly Streamflows for Hyalite Creek at Hyalite Ranger Station (Unregulated Flows, Extended Record Period)
Table 7	-	Monthly Streamflows for Hyalite Creek at Hyalite Ranger Station (Unregulated, 1931-82)
Table 8	-	Gallatin River near Gallatin Gateway (Historic Records, Total Record Period)
Table 9	-	Gallatin River at Logan (Historic Records, Total Record Period)
Table 10	-	East Gallatin River at Bozeman (Historic Records, Total Record Period)
Table 11	-	East Fork of Hyalite Creek (1975-83)
Table 12	-	West Fork of Hyalite Creek (1966-83)
Table 13		East and West Forks of Hyalite Creek (1975-83)
Table 14	-	East and West Forks of Hyalite Creek (1931-82)
Table 15	-	Hyalite Creek Inflow to Reservoir (1931-82)
Table 16	-	Climate Station Index
Table 17	-	Hebgen Dam Precipitation (1887-1983)

LIST OF FIGURES AND TABLES (continued)

TABLES

Table 18	-	Hebgen Dam Precipitation (1931-82)
Table 19	-	Hebgen Dam Precipitation (1935-82)
Table 20	-	Hebgen Dam Precipitation (1937-82)
Table 21	-	Bozeman Precipitation (Historic Period of Record)
Table 22	-	Yellowstone Park Precipitation (Historic Period of Record)
Table 23	-	Lick Creek Precipitation (Historic Period of Record)
Table 24	-	Showers Falls Precipitation (Historic Period of Record)
Table 25	-	Snow Survey Station Index
Table 26	-	Arch Falls Snow Depth
Table 27	-	Arch Falls Snow Water Equivalent
Table 28	-	Devils Slide Snow Depth
Table 29	-	Devils Slide Snow Water Equivalent
Table 30	-	Hood Meadow Snow Depth
Table 31	-	Hood Meadow Snow Water Equivalent
Table 32	-	Lick Creek Snow Depth
Table 33	-	Lick Creek Snow Water Equivalent
Table 34	-	Showers Falls Snow Depth
Table 35	-	Showers Falls Snow Water Equivalent
Table 36	-	Probability Levels for Watershed Yield, Hyalite Creek at Hyalite Ranger Station
Table 37	-	Probability Levels for Watershed Yield, Hyalite Creek at Middle Creek Dam

SUMMARY AND CONCLUSIONS

SUMMARY AND CONCLUSIONS

The study period used in establishing the hydrologic potential for Hyalite Creek Watershed was identified as 1931 through 1982. From a climate standpoint, the selected study period appears to be slightly "surplus". The period does include the widely recognized sustained dry period during the 1930's. Also included in the study period is a sustained surplus period through the 1960's and 1970's, and average conditions particularly during the 1940 to 1960 timespan. The study period does exhibit strong persistence similar to longer record periods. The above comments relating to climate conditions are assumed applicable to hydrologic conditions as well because precipitation is the primary input to runoff. The period 1931-82 is stated herein as being reasonably representative of long-term hydrologic conditions. However, caution should be observed in applying the 52 years of monthly sequential flows to a design operation plan. The caution is issued because the operations plan may be sensitive to storage starting conditions and to the sustained persistence exhibited by the 1931-82 period.

The hydrologic potential analysis focused on two primary locations of interest within the Hyalite Creek Watershed: Hyalite Creek at Hyalite Ranger Station, which is near the mouth of Hyalite Canyon, and Hyalite Creek at Middle Creek Dam. Monthly sequential streamflows were generated at these two locations for the period 1931-82. The long-term mean monthly, unregulated flow for Hyalite Creek near the canyon mouth is estimated to be 46,708 acre-feet (AF). The 50 percent chance and 80 percent chance flows at this location are 45,610 AF and 37,532 AF, respectively. Relative to Hyalite Creek at the dam (also referred to as reservoir inflows), the long-term

mean annual flow is estimated to be 34,768 AF. The 50 percent chance flow is 34,009 AF and the 80 percent chance flow is 27,346 AF.

The monthly sequential reservoir inflows will serve as input to the reservoir operation study. The reservoir operation study will incorporate reservoir inflows, water rights and water use information to establish water availability. The more comprehensive subject of project water availability will be addressed at a later date.

INTRODUCTION

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INTRODUCTION

Hydrologic Potential for Hyalite Creek Watershed is one component of the overall Middle Creek Dam Rehabilitation Feasibility Study. The hydrologic potential discussed herein addresses watershed yield without storage effects. A more complete water availability study is currently in progress which addresses the operation of Middle Creek Reservoir using reservoir inflow, reservoir characteristics, water rights, and water use information.

The primary output of the hydrologic potential study is monthly sequential streamflows for a selected study period. Monthly sequential streamflows for the Hyalite Creek watershed are defined in two locations: at the gaging station for Hyalite Creek at Hyalite Ranger Station (USGS Gage No. 0605000), and at Middle Creek Dam. The streamflows at Middle Creek Dam will hereafter be referred to as "reservoir inflows" and will serve as input to the reservoir operation study.

Streamflows at both locations of interest will be analyzed on a probability basis. The probability study will establish watershed yield for different levels of percent chance (e.g., the 50 percent chance flow, the 80 percent chance flow, etc.). Results of the probability analysis will be of general informational value; whereas, the estimated monthly sequential reservoir inflows will serve as direct input to reservoir operation scenarios in the comprehensive water availability study.

To improve report readability, all figures and tables are presented in the Appendix. All figures are presented first, followed by the tables. The figures and tables are numbered consecutively but independent of each other. In other words, there is both a Figure 1 and a Table 1, a Figure 2 and a Table 2, etc., and there is no particular relationship between them unless by circumstance they happen to address the same subject.

PROJECT DESCRIPTION

PROJECT DESCRIPTION

The following section describes the project location, physiography and watershed characteristics, climate, and hydrology. Each of the subject areas is detailed below.

LOCATION

Hyalite Creek Watershed is located entirely within Gallatin and Park Counties in South-Central Montana. The study area has an approximate latitude of 45 degrees, 30 minutes, and a longitude of 111 degrees. Project location is shown in Figure 1, and the Primary Study Watershed Area is shown in Figure 2. The Primary Study Watershed Area includes that portion of the Hyalite Creek Watershed which is upstream of Middle Creek Dam. It is referred to as "primary" because it specifically addresses the primary objective of this hydrologic potential, which is to develop monthly sequential streamflows upstream of the dam. Of secondary interest is the statement of hydrologic potential at the Hyalite Creek near Hyalite Ranger Station gage (USGS Gage No. 06050000). This secondary location of interest is also shown on Figure 2.

PHYSIOGRAPHY AND WATERSHED CHARACTERISTICS

The primary study watershed area is comprised of a 27 square mile basin which feeds Middle Creek Reservoir. This area can be segregated into three subareas: 11.0 square miles of drainage above the West Fork of Hyalite Creek streamgage (Gage No. 41H01500); 8.4 square miles of drainage above the East Fork of Hyalite Creek streamgage (Gage No. 41H01000); and 7.6 square miles of drainage downstream of the gages but upstream of the dam (see Figure 3). Total drainage area to the downstream location of interest is 48.2 square miles. Table 1 provides a tabular summary of drainage areas for the total study watershed.

The Hyalite Creek Watershed resides in the Gallatin Range of the Rocky Mountain Physiographic Division (Missouri Basin Inter-Agency Committee, 1971). The study watershed is part of the Gallatin River Drainage Basin which is located immediately east of the Madison River Basin and immediately west of the headwaters for the Yellowstone River Basin. All of these basins eventually feed the Missouri River.

Elevations within the primary study watershed area range from approximately 6,700 feet National Geodetic Vertical Datum (NGVD) at Middle Creek Dam to approximately 10,300 feet NGVD along the upper divide. Elevation at the streamgage near the Hyalite Ranger Station is 5,540 feet NGVD.

An area-altitude analysis was performed on the primary study watershed using 15-minute USGS quadrangle maps to characterize the watershed (U.S. Geological Survey, 1955). The results show that nearly two-thirds of the contributing watershed falls within the 7000 to 9000-foot range (see Table 2). Mean basin elevation above the dam is 8324 feet NGVD.

The primary study watershed is nearly rectangular in shape with the East and West Fork drainages above their respective gages assuming an elongated shape along the longitudinal axis. The East and West Forks of Hyalite Creek both drain in a northerly direction above the gages. The 7.6-square mile contributory area below the gages but above the dam is elongated in the transverse direction (see Figure 3). The drainage basin downstream of the dam but upstream of the Ranger Station gage again assumes an elongated shape in the longitudinal axis with a northwest-southeast orientation.

The East and West Fork drainages above the dam are characterized by steep, rugged terrain along the divides, and talus slopes from the exposed rock faces to the stream channels. There are a few high - mountain lakes in both

drainages, and there are scattered clear-cut zones due to timber harvesting. The terrain, climate and soil conditions play an important role in the basin hydrology. A significant amount of precipitation is either absorbed into the soil to be consumptively used by the vegetative cover, or is temporarily lost to the subsurface strata and later shows up as streamflow, or is permanently lost to deep percolation. Overland flow in these mountain drainages is minimal.

The two main feeder streams to the reservoir are the East and West Forks of Hyalite Creek (see Figure 3). (Note: West Fork of Hyalite Creek is also known simply as "Hyalite Creek".) These two streams originate in high snowmelt areas. Stream profiles for the East Fork and West Fork of Hyalite Creek from the watershed divide to the reservoir are plotted in Figures 4 and 5, respectively. The watersheds for the two forks represent about 72 percent of the total contributing watershed to the reservoir. Downstream of Middle Creek Dam, Hyalite Creek has two commonly used names: Hyalite Creek and Middle Creek. (Note: For the purposes of this study, the downstream channel will be referred to as Hyalite Creek.) Hyalite Creek flows approximately 9 miles through a steep, narrow canyon until exiting the Gallatin Range. Hyalite Creek then flows northwesterly and northerly for about 17 miles before joining the East Gallatin River. The East Gallatin River is a tributary of the Gallatin River which, in turn, is a tributary of the Missouri River.

CLIMATE

Climate of the study watershed can be classified as moist subhumid (Missouri Basin Inter-Agency Committee, 1971). Similar to other subbasins in the Gallatin River Basin, Hyalite Creek Watershed typically receives its least precipitation in the summer months of July and August, and the most

precipitation in April through June. September generally initiates an increase in precipitation due to fall rainstorms with snowfall occurring in subsequent months. The snowfall contributes to winter snowpack accumulation. Significant snowmelt above Middle Creek Dam generally does not begin until late-April and can last until the early part of July (see Figure 6). Storms in the form of rain, snow, or snow-mixed-with-rain contribute to the peak precipitation months in the spring. Precipitation data for regional stations and for stations located within the study basin are provided in the Appendix. For general information purposes, the mean annual precipitation for Bozeman (MSU station located about 15 miles north of study watershed) is 18.2 inches, for Hebgen Dam (47 miles southwest of study watershed) is 26.9 inches, for Yellowstone Park (34 miles southeast of study watershed) is 16.5 inches, for Lick Creek Snow Survey Station (1.5 miles north of Middle Creek Dam) is 29.8, and for Shower Falls Snow Survey Station (located above the dam) is 46.6 inches.

Temperatures in the basin follow a diurnal pattern and exhibit definite daily and seasonal variations (see Figure 6). Specific to the typical snowmelt period for the primary study watershed, the Shower Falls Snow Survey Station has the following approximate long-term mean daily temperatures: for May 1, 29 degrees Fahrenheit (F); for May 15, 37 degrees F; for June 1, 37 degrees F; and for June 15, 42 degrees F. Winter time temperatures are consistently below freezing, with occasional severe cold spells and warm, windy "chinook" events.

HYDROLOGY

Streamflow within the study watershed is similar to other snowfed river systems in the Rocky Mountains. The snowpack accumulations begin melting as early as April and occasionally extend into the month of July. Typical maximum runoff months

are May and June. Almost all moisture input, whether it be in the form of rainfall or snowmelt, is absorbed into the soil and reappears in stream channels. Overland flow in these mountain drainages seldom occurs. Typical runoff hydrographs are quite rounded and have a long duration. Peak flows are commonly the result of snowmelt or a combination of rain and snowmelt.

Streamflow monitoring in the Gallatin River Drainage Basin dates back to the late - 1800's. However, a continuous record from that date to the present does not exist on any of the streams in the Gallatin River Basin (U.S. Geological Survey, 1982). Table 3 provides a streamgage index for the regional gages.

The Hyalite Creek Drainage Basin has been monitored continuously since 1934 at the USGS gaging station referred to as Hyalite Creek at Hyalite Ranger Station (USGS No. 06500000). This gage is located approximately 6-1/2 miles downstream of Middle Creek Dam, and just upstream of the canyon mouth (see Figure 2). The gage has an upstream drainage basin of 48.2 square miles (U.S. Geological Survey, 1982). Monthly flows for this gage are presented later in this report.

Additional streamgaging in the Hyalite Creek Basin has been performed on the East and West Forks of Hyalite Creek (Montana Department of Natural Resources and Conservation, 1982). The current East Fork gage (Montana DNRC No. 41H01000) is located about 1 mile upstream of the reservoir, and has a recorded history at this location of Water Year 1975 to the present. The gage location is shown in Figure 2 and the monthly flows for the East Fork gage are provided in the Appendix. The West Fork gage (Montana DNRC No. 41H01500) is located about three-fourths of a mile upstream of the reservoir (see Figure 2). The Soil Conservation Service monitored the West Fork gage

on a seasonal basis from 1966 to 1974. The Montana DNRC began servicing the station in Water Year 1975 and continues to the present. As with the East Fork records, monthly flows for the West Fork of Hyalite Creek are presented in the Appendix. Monthly sequential reservoir inflows are discussed in the report section entitled Technical Analyses.

BASELINE DATA

BASELINE DATA

Baseline information for the hydrologic potential study consisted primarily of streamflow and climate data. Snow data was considered but not directly applied in satisfying study objectives. Each of the data categories is detailed below.

STREAMFLOW DATA

Streamflow data consisted of daily and monthly flows for selected gaging sites in the Gallatin River Basin. A listing of the gages and related statistics is provided in Table 3. Primary emphasis was given to the following gaging stations: Hyalite Creek at Hyalite Ranger Station; East and West Forks of Hyalite Creek; and Gallatin River near Gallatin Gateway. The stations referred to as Gallatin River at Logan and East Gallatin River at Bozeman were considered but to a lesser degree of detail. The appendix contains tabulated summaries of all streamflow data used in the study (see Tables 4 through 15).

Daily flows were used in gaining an understanding of the hydrologic response for the East and West Fork drainages. Daily flows are also used to generate monthly flows. The monthly flows were used in volume analyses for this study, particularly in developing estimates of long-term hydrologic conditions and in developing seasonal probability results.

CLIMATE DATA

Climate data consisted primarily of monthly and annual precipitation records. The climate stations which provided primary input to the study are listed in Table 16. Tabulated summaries for the climate baseline data are provided in Tables 17 through 24 in the Appendix.

Monthly and annual precipitation records were used in developing a perspective of the regional climate and microclimates. All stations listed in Table 16 were included in the perspective.

SNOW DATA

Five SCS snow survey stations were examined for snow data, and they are as follows: Arch Falls, Devils Slide, Hood Meadow, Lick Creek, and Shower Falls. All stations are located within the primary study watershed except for Lick Creek which is located approximately 1-1/2 miles north of Middle Creek Dam (see Figure 3). Pertinent station statistics are given in Table 25. Snow Data for all stations is provided in Tables 26 through 35 of the Appendix.

The snow data was used primarily for general information purposes. Because reasonably satisfactory streamflow data is available, it was not necessary to develop a watershed model that incorporates snow factors in predicting runoff.

TECHNICAL ANALYSES

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TECHNICAL ANALYSES

The following section describes the technical analyses performed in defining the hydrologic potential of the Hyalite Creek Watershed. The section is subdivided into two main subject areas: Study Period and Streamflow Hydrology.

STUDY PERIOD

General

For the purpose of most water availability studies, it is not sufficient to simply quantify flow for the historic record period of the stream gages of interest. It is necessary to determine the long-term representativeness of a specific study period which commonly does not coincide with the historic record period. To select a representative study period, available long-term and short-term hydrological and climatological data were analyzed.

The preferred method for determining the long-term hydrologic representativeness of a selected study period is to compare the hydrologic characteristics of an abbreviated period for the stream in question to a long-term measured period for the same stream. An alternative method is to identify a hydrologically similar stream in the region having a long period of record and compare the hydrologic characteristics of the selected study period to the total record period. Specific to the Hyalite Creek Watershed, there is a reasonably adequate information base at the Hyalite Creek streamgage near the Ranger Station (see Table 3 for period of record). However, the streamflow records are not sufficiently complete and extensive to independently establish long-term representativeness.

As a substitute for streamflow records, climatological records for a region can be used in the determination of data and period representativeness. Commonly, precipitation records are used for this purpose. While it is not true that there is a direct relationship between precipitation and runoff, it is generally true that on a long-term basis, precipitation trends are reflected in streamflow trends. Therefore, it is reasonable to use long-term precipitation records and trends as general indicators in the determination of long-term streamflow representativeness.

An additional reason for using precipitation records is that generally longer and more complete records exist for precipitation than exist for streamflow. This is the case for the Hyalite Creek Watershed study.

Several regional precipitation gages were evaluated for use in the long-term representativeness determination and they include: Hebgen Dam, Montana; Bozeman, Montana; and Yellowstone Park, Wyoming. The Hebgen Dam gage was selected for a detailed analysis based on station location, length of measured record, and its preferred statistical relationship with the Shower Falls snow survey station located within the watershed. Precipitation data for the Hebgen Dam station is shown in Tables 17 through 20. Precipitation data for a few years in the early-1900's, and for 1926, were synthesized using the Yellowstone Park records. Table 17 shows the extended data base for Hebgen Dam which spans from 1887 to 1983. Because of incomplete records for 1887, 1888 and 1983, the actual period of analysis for the detailed study is 1889 to 1982.

Three different methods were used in the determination of long-term representativeness, all of which serve to identify trends, variations relative to long-term norms, and anomalies. The three methods are as follows: cumulative surplus/deficit

analysis, statistical parameter review, and graphical analysis. Each method and its respective results are described in detail below.

Specific to the first two methods, HKM has computerized the analysis to allow the examination of many possible abbreviated time periods in selecting a representative study period. The time periods examined in the analysis include: 1889-1982, 1931-82, 1935-82, and 1937-82. The present analysis paid particular attention to the period from the 1930's to 1982 because continuous hydrologic data is available on Hyalite Creek from 1934 to the present. Also, it was desirable to include the early - to mid-1930's because it is widely recognized as a regional drought period.

Cumulative Surplus/Deficit Analysis

A cumulative surplus/deficit analysis involves constructing and analyzing a curve which represents the cumulative departure from the normal precipitation for each year. In the cumulative surplus/deficit plot, the departure is indicated on the ordinate, or the vertical axis, and the year of record is indicated on the abscissa, or the horizontal axis. A positive departure from the normal precipitation represents a surplus and a negative departure represents a deficit. For any period of record, the mathematical operation is such that the plot will always start and end at zero. As will be shown later, the plot is sensitive to starting conditions.

Surplus/deficit curves aid in the identification of surplus periods, of deficit periods, and of severity and extent of one condition or another. They also aid in the determination of variability. The slope of the curve is particularly important in analyzing the graphical plot. The magnitude of the slope and the length of the period until the slope changes are both

indications of the magnitude of the cumulative departures and, hence, indications of the magnitude of a deficit period or of a surplus period. An abbreviated period can be compared to a longer period at the station being analyzed to establish the representativeness of the abbreviated period.

Three surplus/deficit curves were developed for the Hebgen Dam precipitation station. The first plot is for the entire Hebgen Dam period of record, which is 1889 through 1982. A second plot was made for the abbreviated period 1931 to 1982, and the third plot is for the period 1937 to 1982. The reason for making the second and third plots was to examine alternate starting conditions and observe sensitivity to the starting date. The objective of selecting an abbreviated period contained within the overall measured record period is to select a period when streamflow data is available and to improve the manageability of the data base. Comparison of the plots for the abbreviated periods 1931-82 and 1937-82 versus 1889-82 allows evaluation of the long-term representativeness.

The three surplus/deficit curves for the Hebgen Dam precipitation station are shown in Figures 7, 8, and 9. Figure 7 shows the entire 1889 to 1982 period. Figure 8 shows the abbreviated 1931 to 1982 period, and Figure 9 shows the abbreviated period 1937 to 1982.

Comparison of Figures 7, 8, and 9 indicates both similarities and dissimilarities between the abbreviated periods and the period 1889-1982. All surplus/deficit curves contain periods of sustained deficit and periods of sustained surplus. The deficit exhibited in Figure 7 from 1902 to approximately 1920 is roughly balanced by the surplus period beginning in the 1960's and continuing to the late-1970's. The period from about 1920 to 1960 appears to be about average. However, when different starting conditions and a different plotting scale

are used as depicted in Figure 8, it becomes apparent the early-1930's and the period from 1941 to 1960 are not-so-average, but in fact indicate deficit periods. Similar to Figure 7, deficits realized early in the study period are essentially balanced by the surplus period after 1960. Figure 9 represents yet another starting condition and period of analysis. The starting year, 1937, experienced a surplus precipitation (i.e., 31.22 inches versus long-term mean of 26.86 inches). The starting condition, plus the shift in the long-term annual mean, causes a change in the plotted results. Figure 9 shows more oscillation about the zero, or neutral, line, and hence, gives the appearance of being more balanced in terms of surpluses and deficits throughout the period. This appearance presents somewhat of a false interpretation. Figure 9 shows that the annual precipitation sequence for study period 1937-82 more regularly oscillates about its arithmetic mean, but this is not necessarily an objective here because characteristically the microclimate exhibits strong persistence. (Defn: Persistence means that the successive members of a time series are linked among themselves in some persistent manner, resulting in non-pure-randomness. Due to meteorological and climatic causes, it has been found that wet years tend to occur in groups and dry years to occur together likewise. Chow, 1964).

Another argument against using the period 1937-82 is that the annual mean for 1937-82 is nearly 9 percent greater than the long-term annual mean for 1889-1982. The period 1931-82 has an annual mean only 6 percent greater than the long-term mean.

In conclusion, the cumulative surplus/deficit analysis indicates the period 1931-82 is generally acceptable, and certainly preferred over a period which does not include the early-to-mid-1930's. A final statement of period acceptability

is not made until after examining the second and third methods of analysis (i.e., statistical parameter review and graphical analysis).

Statistical Parameter Review

The second method used in the determination of long-term representativeness consists of examining statistical parameters of monthly and annual precipitation data. The Hebgen Dam station was used for statistical parameter review. The main parameters evaluated in this analysis are the arithmetic mean, standard deviation, and the coefficient of variation. The arithmetic mean provides a measure of the central or average tendency of precipitation. The standard deviation describes the absolute variation of each set of monthly and annual data. The coefficient of variation describes the relative variation for monthly and annual data for each trial period.

Comparison of statistical parameters for the 1931-82 period versus the same parameters for the 1889 to 1982 period aids in determining the representativeness of the abbreviated period. Mean annual precipitation during the 1931-82 period was determined to be 28.21 inches as compared with 26.58 inches for 1889-1982. Hence, mean annual precipitation at Hebgen Dam was approximately 6 percent greater in the abbreviated period. The 6 percent difference may seem large on first appearance but it should be realized that variability in precipitation conditions is generally dampened during the runoff process. In other words, a 6 percent difference in precipitation values does not necessarily apply with equal magnitude to streamflows. Another point to be factored into the comparison is the accuracy level of actual measured records. The precipitation values are probably no better than a plus-or-minus range of 5 to 10 percent.

The standard deviation (SD) of annual precipitation amounts for 1931-82 is 5.11 as compared with 4.93 for the period 1889-1982. The difference is within 4 percent which is acceptable.

The final statistical parameter to be reviewed on an annual basis is the coefficient of variation (CV). For the period 1931 to 1982, the CV is 0.181, and for the long-term period 1889 to 1982, the CV is 0.214. The difference of about 15 percent is expected because the annual mean was higher for the abbreviated period and the SD was lower, which causes a compounding effect in the CV difference. The following formula illustrates the compounding effect: $CV = \text{mean}/SD$. The 15 percent difference in CV for the annual precipitation values does not disqualify the period 1931-82 as being reasonably representative of long-term climate conditions. Annual and monthly statistical parameters for the two periods of record can be reviewed in Tables 17 and 18.

Graphical Analysis

An additional way that data and period representativeness can be reviewed is by using a graphical plot. For this study, a plot was made of mean annual precipitation for the Hebgen Dam station (see Figure 10) for the period 1931 to 1982.

Observation of Figure 10 focuses attention on the variability and persistence of annual precipitation in the study basin. The characteristic of variability is quite obvious in the figure, but some guidance is needed relative to persistence. The period from 1889 to 1903 was basically a surplus period, and the period from 1904 to 1936 was a deficit period. About average conditions persisted from 1937 through 1960. Since 1960, conditions have been generally surplus.

In addition to annual variability and persistence trends, it is also possible to note the extent of deviation between the annual mean for a specific year and the long-term mean for the study period. The main benefit afforded by use of this type of analysis is that it allows a visual review and verification of which periods are wet and which periods are dry.

Summary. Several conclusions can be drawn from the combined evaluation of all techniques used to determine data and period representativeness, and they are as follows:

1. Using regional precipitation data, it was found that the period 1931 to 1982 is only slightly more surplus than a period which extends back to the late - 1880's.
2. Within the level of accuracy that can be obtained for a study such as this, the period 1931 to 1982 is considered to be reasonably representative of long-term climatic conditions for the study basin.
3. Because precipitation is the primary input parameter which dictates the amount of runoff that will occur, it was concluded that precipitation trends are generally indicative of runoff trends.

Consequently, the period 1931 to 1982 is considered to be representative of long-term hydrologic conditions as well as climatic conditions. However, caution should be exercised when applying the 1931-82 monthly sequential flows to a design project operation schedule. The caution is noted because the operations analysis may be sensitive to storage starting conditions and to the sustained persistence exhibited by the 1931-82 period.

STREAMFLOW HYDROLOGY

Streamflow quantification studies commonly rely on available hydrologic data. A rule of thumb is that the greater the quantity of available streamflow data and the better the quality of the data, the more accurate the study results will be. Even the most sophisticated hydrologic models may yield poor results when the quantity and quality of available data is limited. The present study is fortunate in that there are reasonably adequate measured streamflow records on Hyalite Creek and regional streams, and hence, significant synthesization of records was unnecessary. The streamflow hydrology analysis focused on two locations within the Hyalite Creek Watershed: Hyalite Creek at Hyalite Ranger Station and Hyalite Creek at Middle Creek Dam. The study technique and results for each of these locations is described below.

Hyalite Creek at Hyalite Ranger Station

The measured period of record for Hyalite Creek at Hyalite Ranger Station includes a few miscellaneous measurements from 1895 to 1904, and a continuous record from 1934 to the present (see Table 3). The USGS notes that, in general, the records are good except those for winter periods, which are poor. Records at this station have reflected a regulated flow condition since March 1951 due to Middle Creek Reservoir. Actual measured records for the total period of record are provided in Table 4.

The records since March 1951 were adjusted to account for storage effects and thus represent an unregulated condition. Evaporation losses at Middle Creek Reservoir were found to be insignificant, and deep percolation losses of stored water were assumed to be insignificant. No adjustment was necessary for

seepage around and through the dam because it was assumed the seepage water returns to Hyalite Creek downstream of the dam but upstream of the Ranger Station gage. Hence, dam seepage conditions are already included in the gaged records. It is further assumed that the seepage condition does not significantly affect the temporal (i.e., of or relating to time) characteristic of Hyalite Creek monthly flows at the Ranger Station gage. Consequently, the only adjustment made to the Ranger Station records was related to the monthly change in reservoir contents. Table 5 presents unregulated flows for the Hyalite Creek at Hyalite Ranger station for the total historic period of record.

The "unregulated" flows for the Hyalite Creek at the Hyalite Ranger Station for the total period of record were compared to the selected study period of 1931 to 1982. It was found that records for the years 1931 through 1934 were not available. To fill in the missing records, statistical correlations were performed between the Hyalite Creek at Hyalite Ranger Station monthly streamflow records and the streamflow records at Gallatin River near Gallatin Gateway (USGS No. 06043500) and Gallatin River at Logan (USGS No. 06052500). Tables 8 and 9 present historic records for Gallatin River near Gallatin Gateway and Gallatin River at Logan, respectively. The preferred correlation matched Hyalite Creek at the Hyalite Ranger Station (dependent variable) with Gallatin River at Gallatin Gateway (independent variable). The selected prediction equation is as follows:

$$Y = 115.95 + 0.076X$$

where: Y = monthly streamflow for Hyalite Creek at
Hyalite Ranger Station, AF

X = monthly streamflow for Gallatin River at
Gallatin Gateway, AF

The related statistics for the above prediction are as follows: correlation coefficient = 0.96, and the coefficient of determination = 0.92.

The correlation with the Gallatin River near Gallatin Gateway filled in a few years in the late-1800's and 1931-34. Of most importance in the present study were the years 1931-34 which were needed to complete the Hyalite Creek data base for the selected study period. The results of the correlation analysis are shown in Tables 6 and 7. These results reflect extended, unregulated streamflows for the specified period: "extended because of the correlation with Gallatin River near Gallatin Gateway, and "unregulated" because of reservoir change in content adjustments. Table 6 is Hyalite Creek at Hyalite Ranger Station for the total period of record, and Table 7 is the same stream but for the abbreviated period 1931-82. Table 7 specifically presents monthly sequential and annual streamflows in acre-feet (AF) for each year from 1931 to 1982. The table also presents estimates of long-term mean monthly and mean annual flows in AF. The mean annual flow for the total period of record is 48,399 AF, and for the period 1931-82, the mean annual flow is 46,708 AF. As previously concluded, the study period for further analysis is 1931-82. Hence, the 46,708 AF value is identified as the estimated long-term mean annual flow at this location. The 46,708 AF is equivalent to approximately 18.2 inches for the 48.2-square mile drainage basin. It also reduces to 969 AF per square mile watershed yield.

A probability analysis was performed on the Hyalite Creek at Hyalite Ranger Station streamflows to identify flow conditions on a probability basis. The analysis was performed on each monthly sequence, and the annual sequence, using the Weibull Plotting Position formula. The Weibull formula takes the following form:

$$\text{Probability (decimal)} = \frac{m}{n+1}$$

Where:

m = rank

n = number of data points in the
sequence

The probability results are shown in Table 36 of the Appendix. Table 36 presents different percent chance levels for watershed yield. These results do not reflect percent yield for the overall project, including regulation effects of Middle Creek Reservoir. Project percent yield estimates will be provided at a later date at the completion of the more comprehensive water availability study.

Hyalite Creek at Middle Creek Dam

The second location of interest for the present study has been identified as Hyalite Creek at Middle Creek Dam. The results of the following analysis will provide an estimate of the 1931-82 monthly sequential reservoir inflows for this location.

As noted in the project description section, streamgaging has been performed on the East and West Forks of Hyalite Creek, which are above Middle Creek Reservoir. The Montana DNRC has maintained records on the two forks since 1975. The Soil Conservation Service monitored the West Fork gage on a seasonal basis from 1966 to 1975. Gage locations are shown in Figure 2 and historical data are presented in Tables 11 and 12. Table 12 for the West Fork includes the SCS seasonal records.

The East and West Fork historical records were combined for analytical purposes. Because concurrent records for the period

1966-74 are not available on the East Fork, the seasonal records on the West Fork were excluded from further analysis. However, before deleting the seasonal records, the effect of including/excluding the data was examined and it was concluded that only an insignificant change in the overall results would occur. The East Fork and West Fork combined data base, for the common period 1975-82, is shown in Table 13.

The measured period of 1975-82 for the two forks is far short of the selected study period, 1931-82. A statistical correlation was performed to extend the combined East and West Fork flows back to 1931. The selected correlation station was Hyalite Creek at Hyalite Ranger Station. Table 7 shows the extended, unregulated monthly sequential streamflows for Hyalite Creek at the Ranger Station which were used in the correlation analysis. The prediction equation used for data extension is as follows:

$$Y = -206.247 + 0.6646X$$

Where:

Y = monthly streamflow for the combined East and West Forks at the gages, AF

X = monthly streamflow for Hyalite Creek at Hyalite Ranger Station, AF.

The results after completing the extension are shown in Table 14, East and West Forks of Hyalite Creek. Related statistics for the prediction equation are as follows: correlation coefficient = 0.95, and the coefficient of determination = 0.90. The estimated long-term mean annual flow for East Fork plus West Fork above their respective gages is 28,568 AF for an average yield per unit area of 1473 AF per square mile ($28,568 / (8.4 + 11.0) = 1473$). Another way of reporting the 28,568 AF is that it is equivalent to 27.4 inches of runoff for the 19.4 square mile drainage basin.

The above results do not include the contributing area downstream of the East and West Fork gages and upstream of the dam (see Figure 2). Table 1 indicates that the total drainage area to the dam is 27.0 square miles. Hence, the intervening drainage basin amounts to 7.6 square miles. In order to more completely reflect all inflows to the reservoir, it was necessary to include the anticipated yield from the 7.6 square miles.

The combined East and West Fork sequential monthly flows were hydrologically transferred downstream to the dam to more completely reflect all reservoir inflows. The transfer was accomplished by examining runoff per unit area estimates for the gaged locations on the Hyalite Creek Watershed, and by examining watershed characteristics.

For the runoff per unit area approach, yield estimates were reviewed for Hyalite Creek flows at the Hyalite Ranger Station and at the East and West Fork of Hyalite Creek gages. A yield estimate was then developed for the 27.0-square mile drainage basin at the dam using linear interpretation on a graphical plot. As an example, the long-term mean annual flow at the Ranger Station gage was found to be 46,708 AF, or 969 AF per square mile. The total annual runoff above the East and West Fork gages was found to be 28,568 AF, or 1,473 AF per square mile. According to the graphical plot, the annual unit runoff for a 27.0-square mile area would be approximately 1330 AF per square mile. When expanded, the 1330 AF per square mile becomes 36,000 AF.

A refinement was considered necessary in the above technique and results because it is expected that factors other than drainage area play a role in determining basin runoff. One watershed characteristic that can be easily calculated and has a definite correlation to runoff potential in the Hyalite Creek

Watershed is mean basin elevation. The mean basin elevation for the drainage area above the East and West Fork gages is approximately 8,570 feet NGVD. For the area between the gages and the dam, the mean basin elevation is about 7,710 feet NGVD. Hence, there is about a 10 percent reduction in the mean basin elevation. To account for this reduction, it was assumed that the runoff per unit area should be reduced by 10 to 15 percent. A 12 percent reduction was selected, which results in an average unit runoff of about 1,290 AF per square mile. When expanded for the 27 square miles of contributing area, the estimated long-term mean annual reservoir inflow is approximately 34,800 AF. The index factor to transfer the combined flows at the East and West Fork gages to the reservoir was calculated to be 1.217 ($34,800/28,600 = 1.217$). It was assumed that the index factor was equally applicable to monthly flows as well as annual values. Hence, the final sequential monthly flows that represent total inflow to Middle Creek Reservoir are simply the 1931-82 sequential monthly flows shown in Table 14 multiplied by 1.217. The final reservoir inflows are shown in Table 15.

Similar to the downstream location of interest (i.e., Hyalite Creek at Hyalite Ranger Station), a probability analysis was performed on the reservoir inflows. The analysis was performed for each month, and on an annual basis, for the study period of 1931-82. The Weibull Plotting Position formula was again applied. Table 37 summarizes the probability levels for watershed yield.

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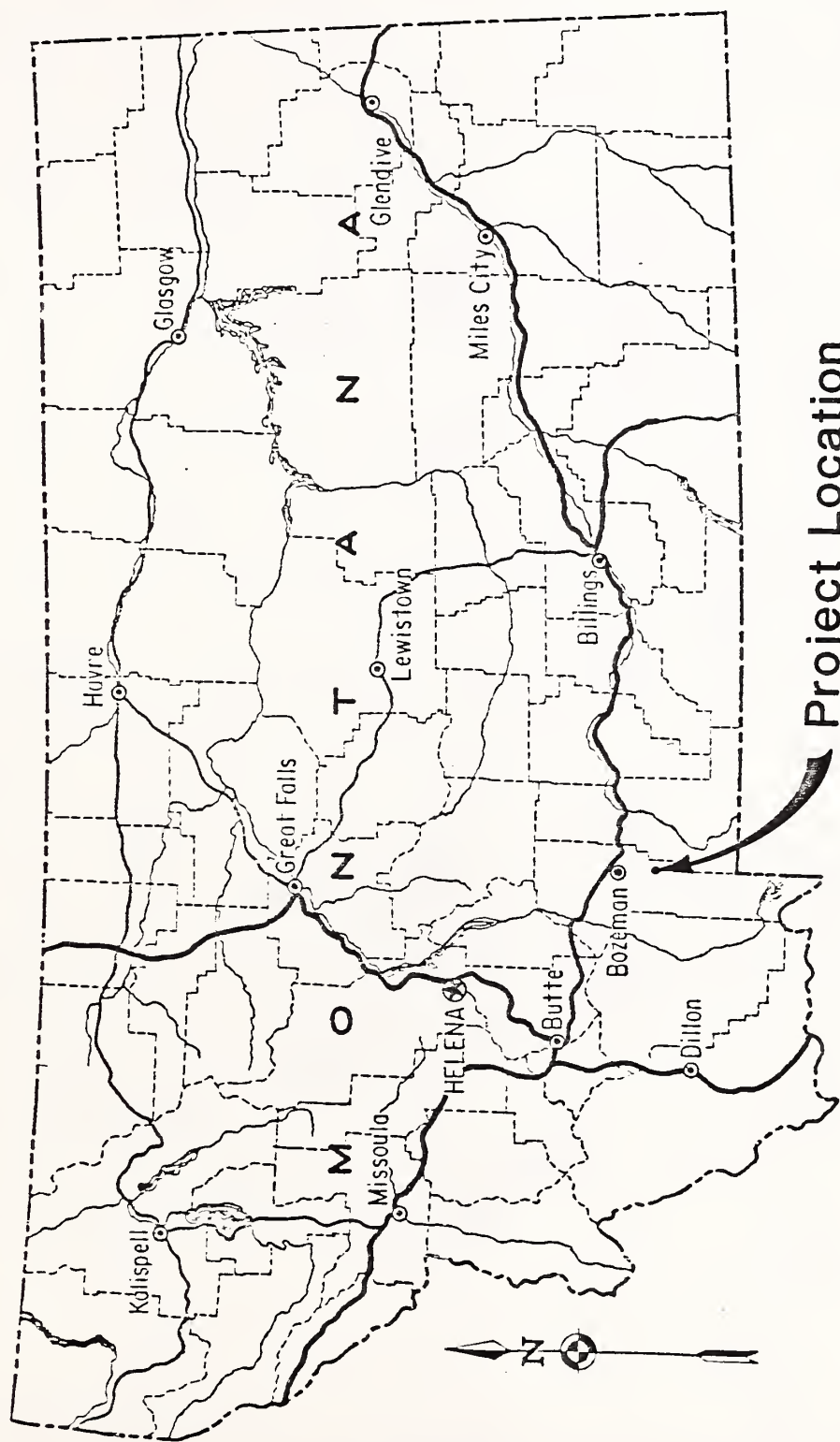
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APPENDIX

FIGURES



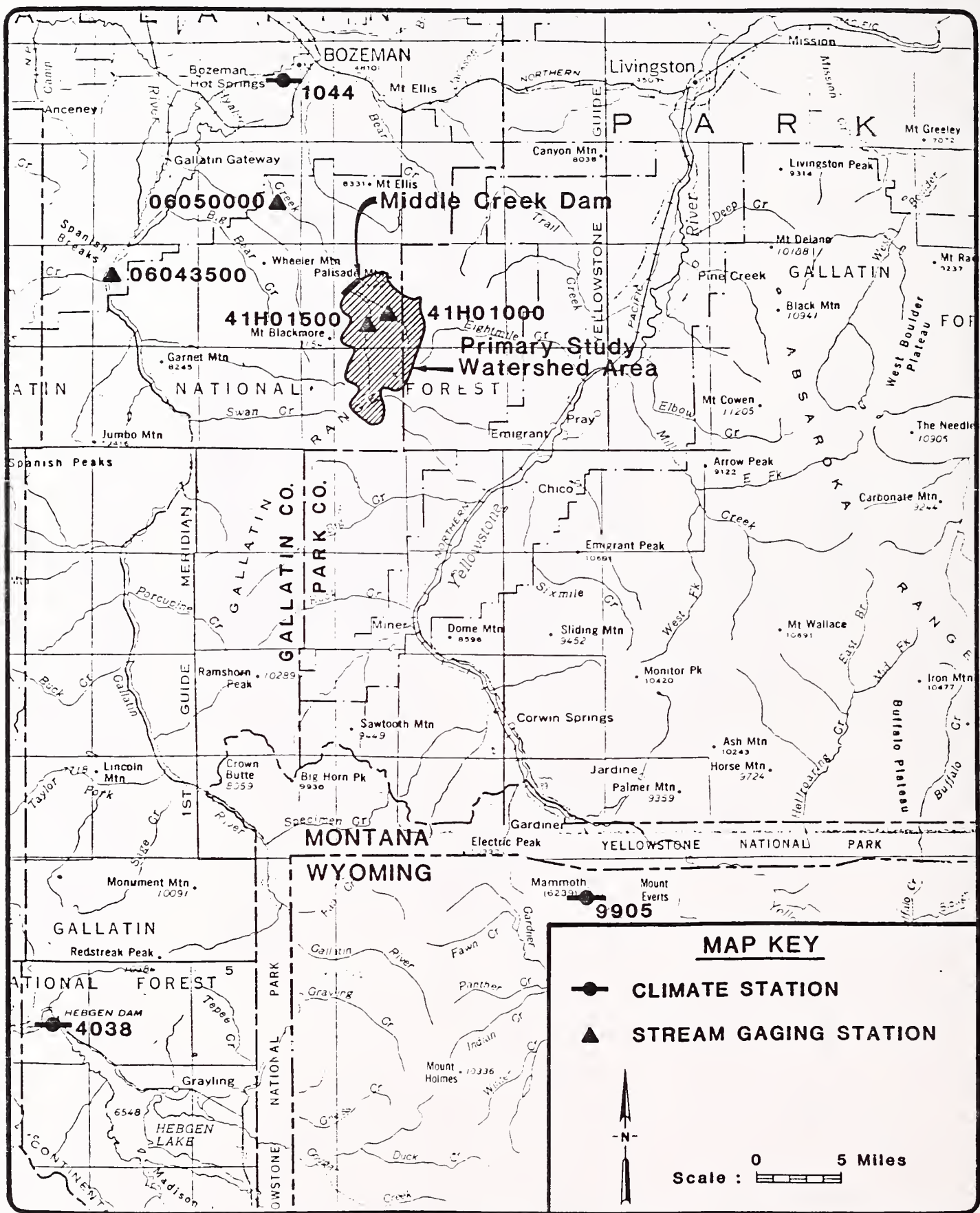
Project Location

MIDDLE CREEK DAM VICINITY MAP

FIGURE 1
H&M ASSOCIATES
ENGINEERS — PLANNERS

8M087.113

NOVEMBER 1983



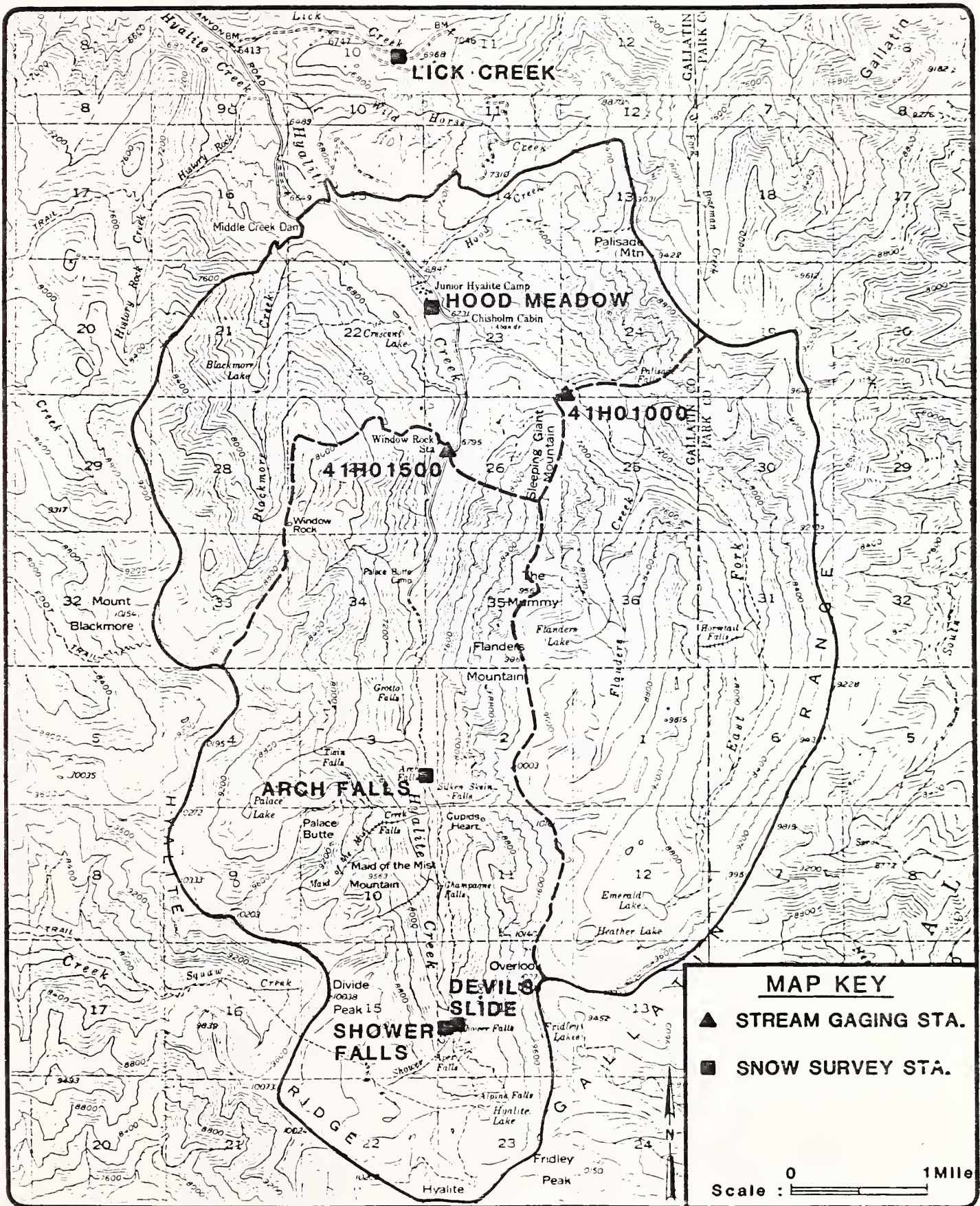
MIDDLE CREEK DAM LOCATION MAP

FIGURE 2

HEM ASSOCIATES

8M087.113

NOVEMBER 1983



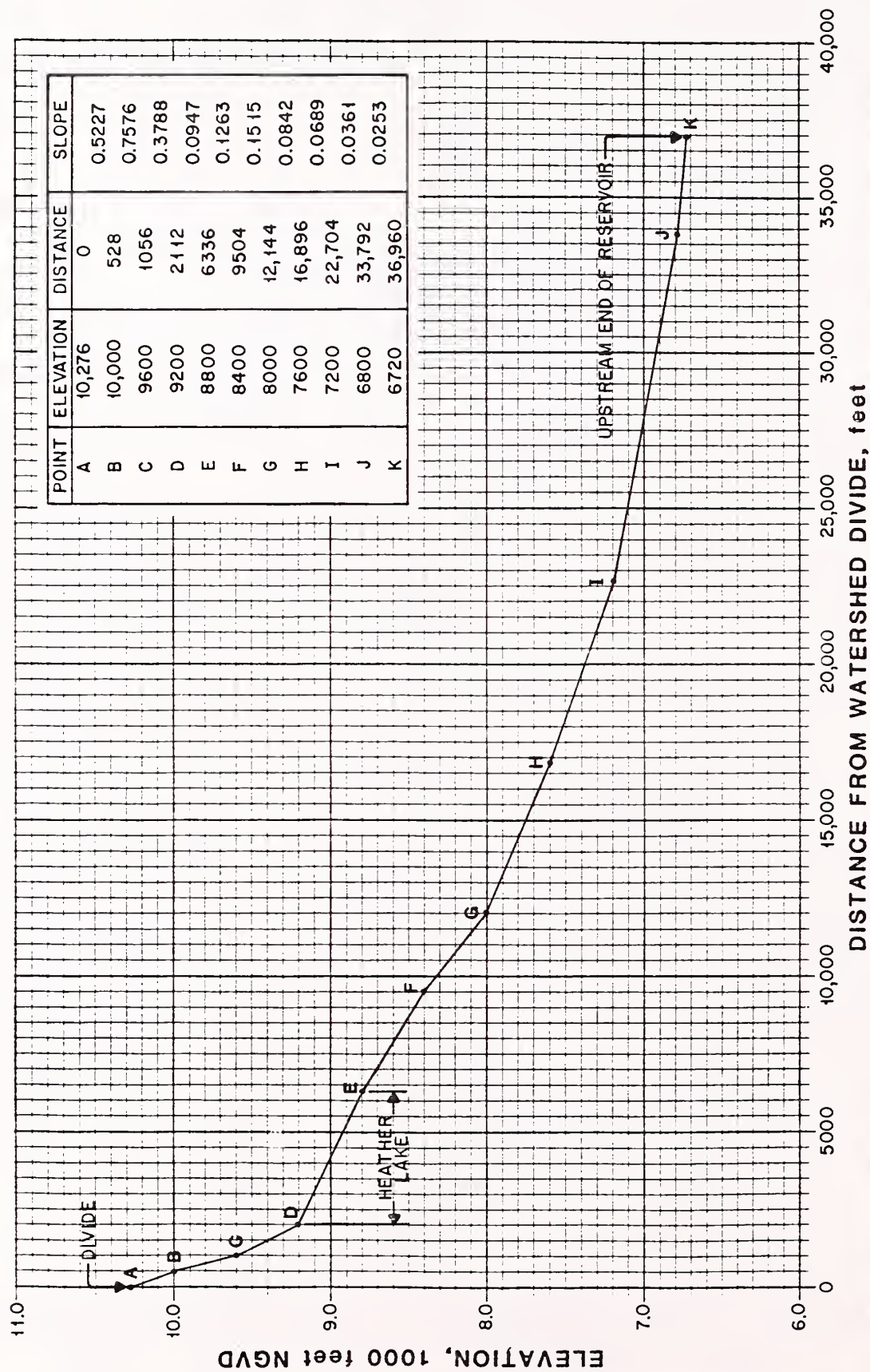
MIDDLE CREEK DAM DRAINAGE AREA MAP

8M087.113

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FIGURE 3

HKM ASSOCIATES
ENGINEERS PLANNERS



MIDDLE CREEK DAM

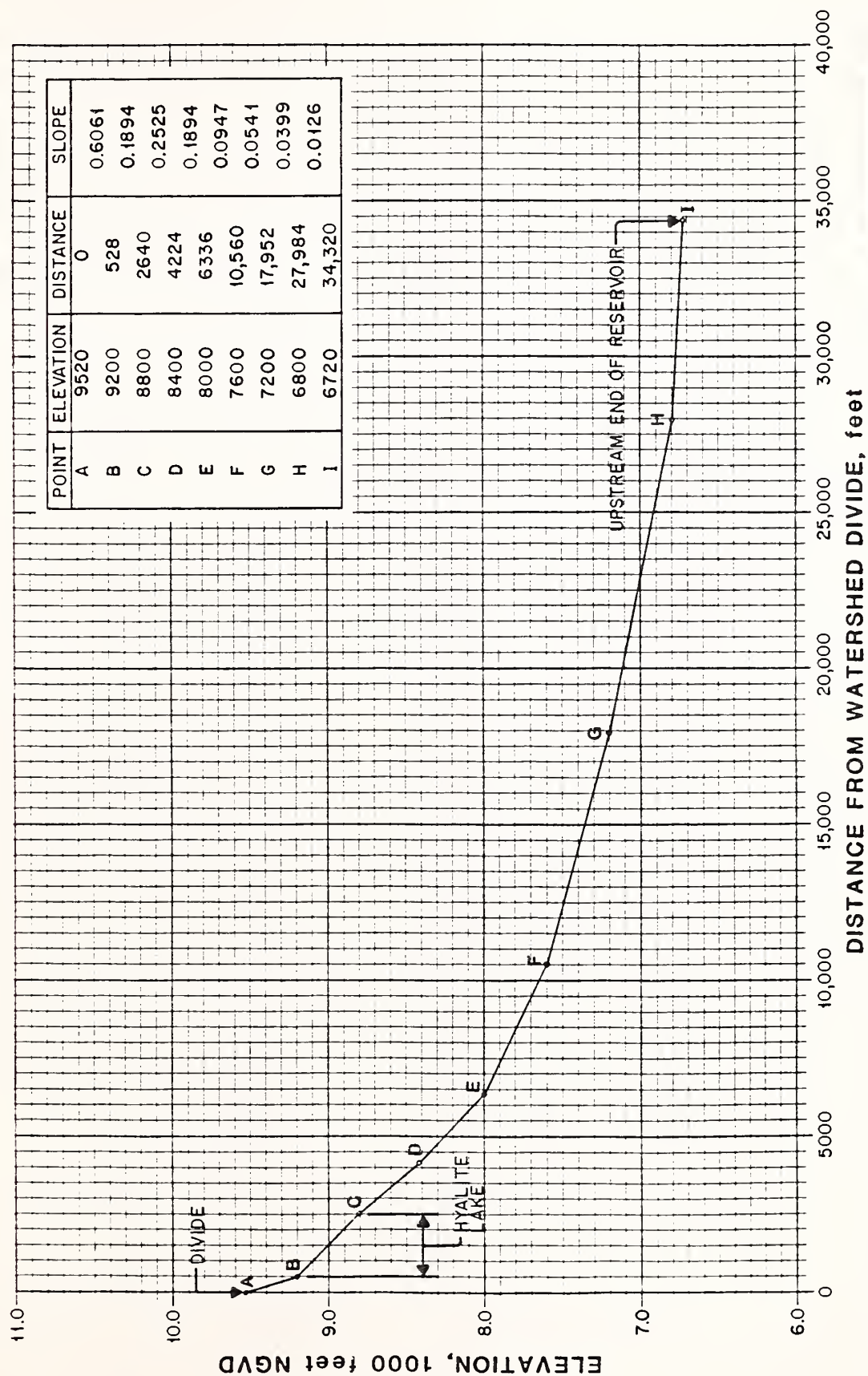
EAST FORK OF HYALITE CREEK STREAM PROFILE

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FIGURE 4

HKA ASSOCIATES
ENGINEERS - PLANNERS



MIDDLE CREEK DAM

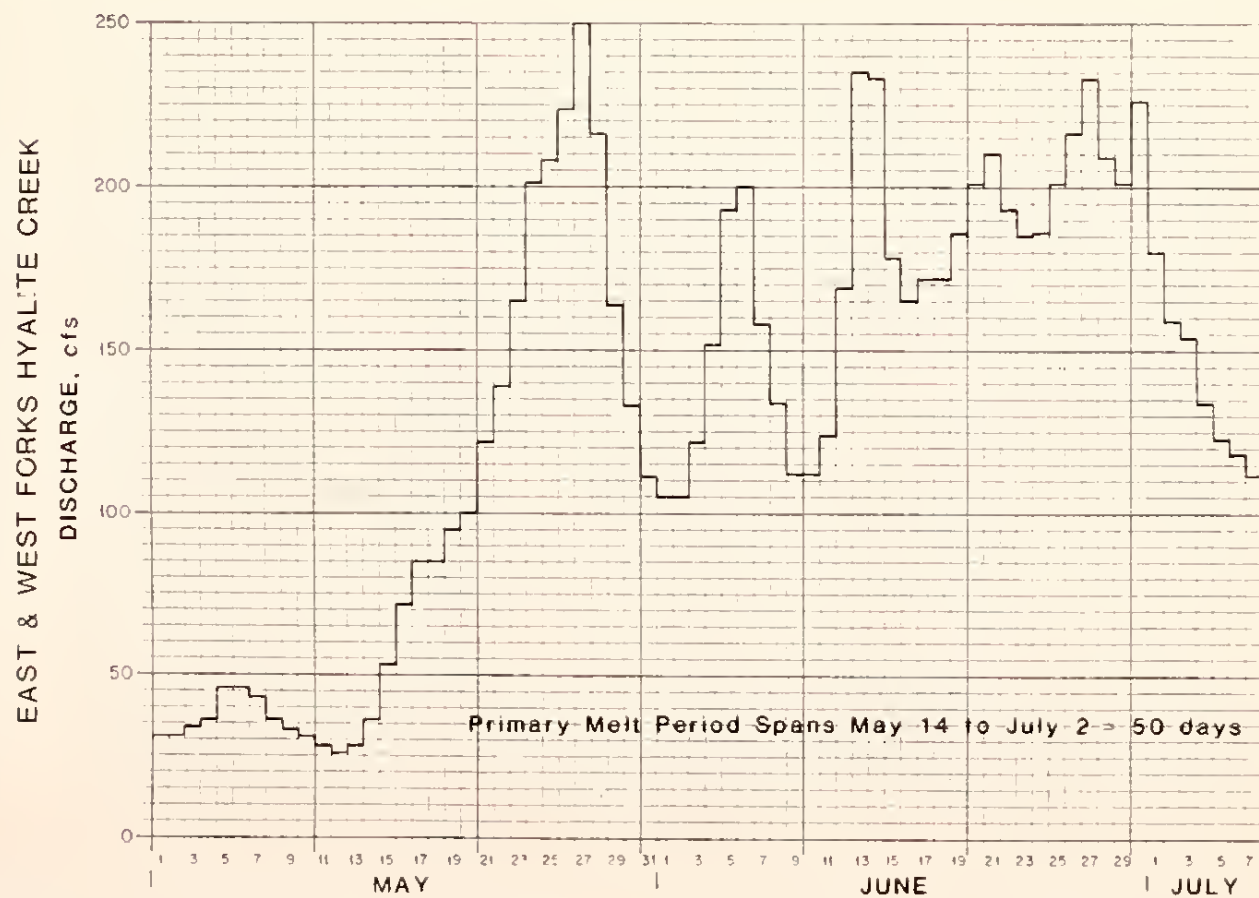
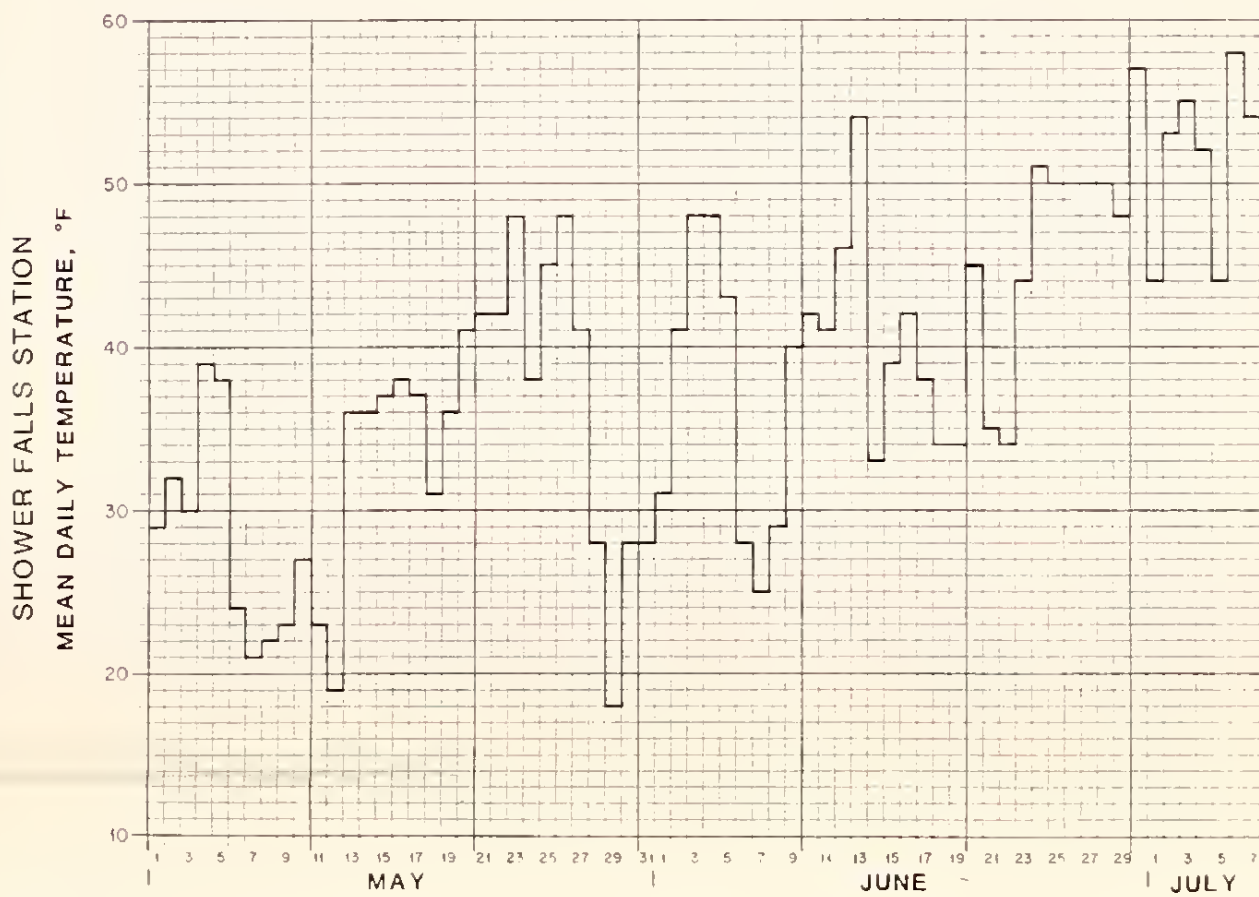
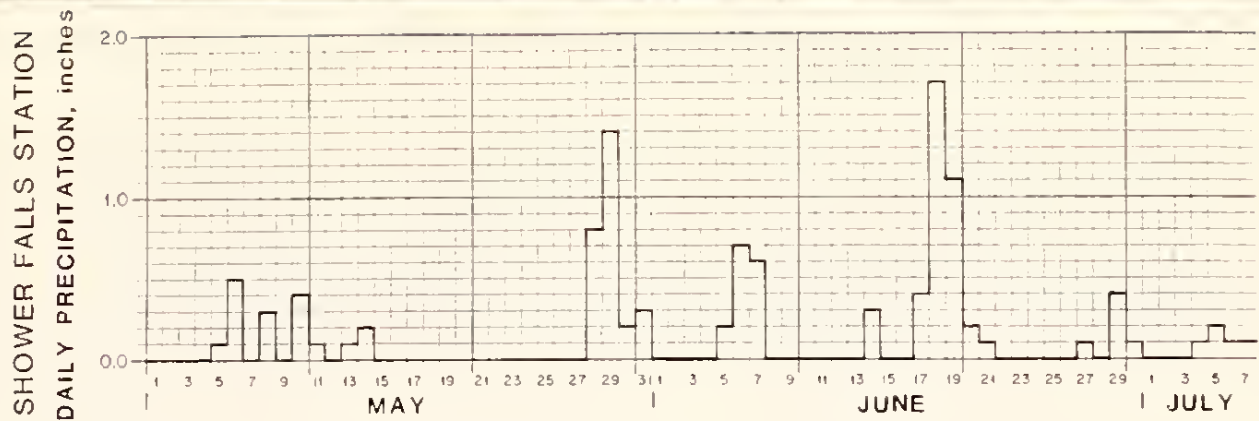
WEST FORK OF HYALITE CREEK STREAM PROFILE

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NOVEMBER 1983

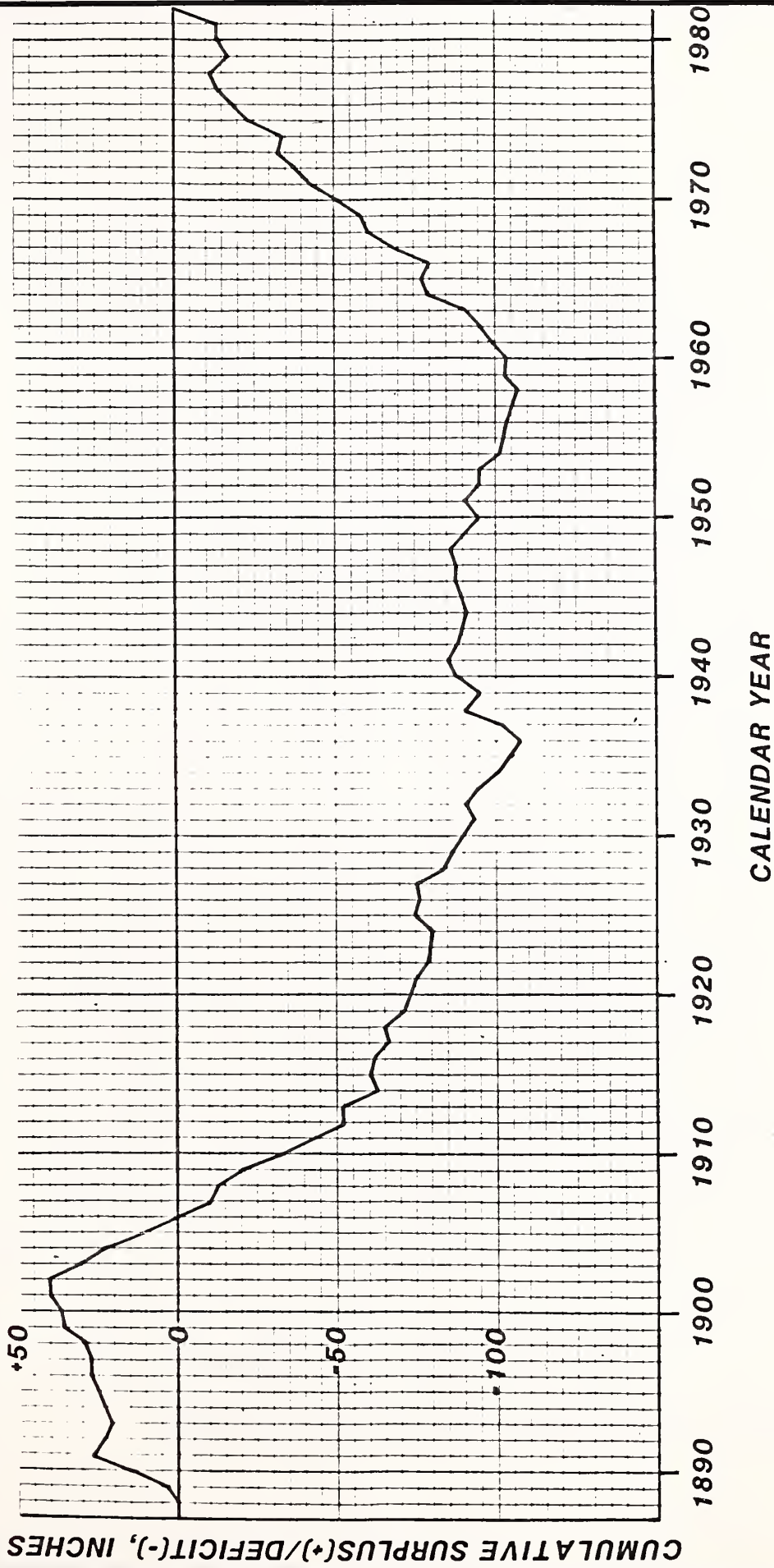
FIGURE 5

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MIDDLE CREEK DAM
1979 CLIMATIC AND HYDROLOGIC DATA

FIGURE 6
HKM ASSOCIATES
ENGINEERS PLANNERS



MIDDLE CREEK DAM

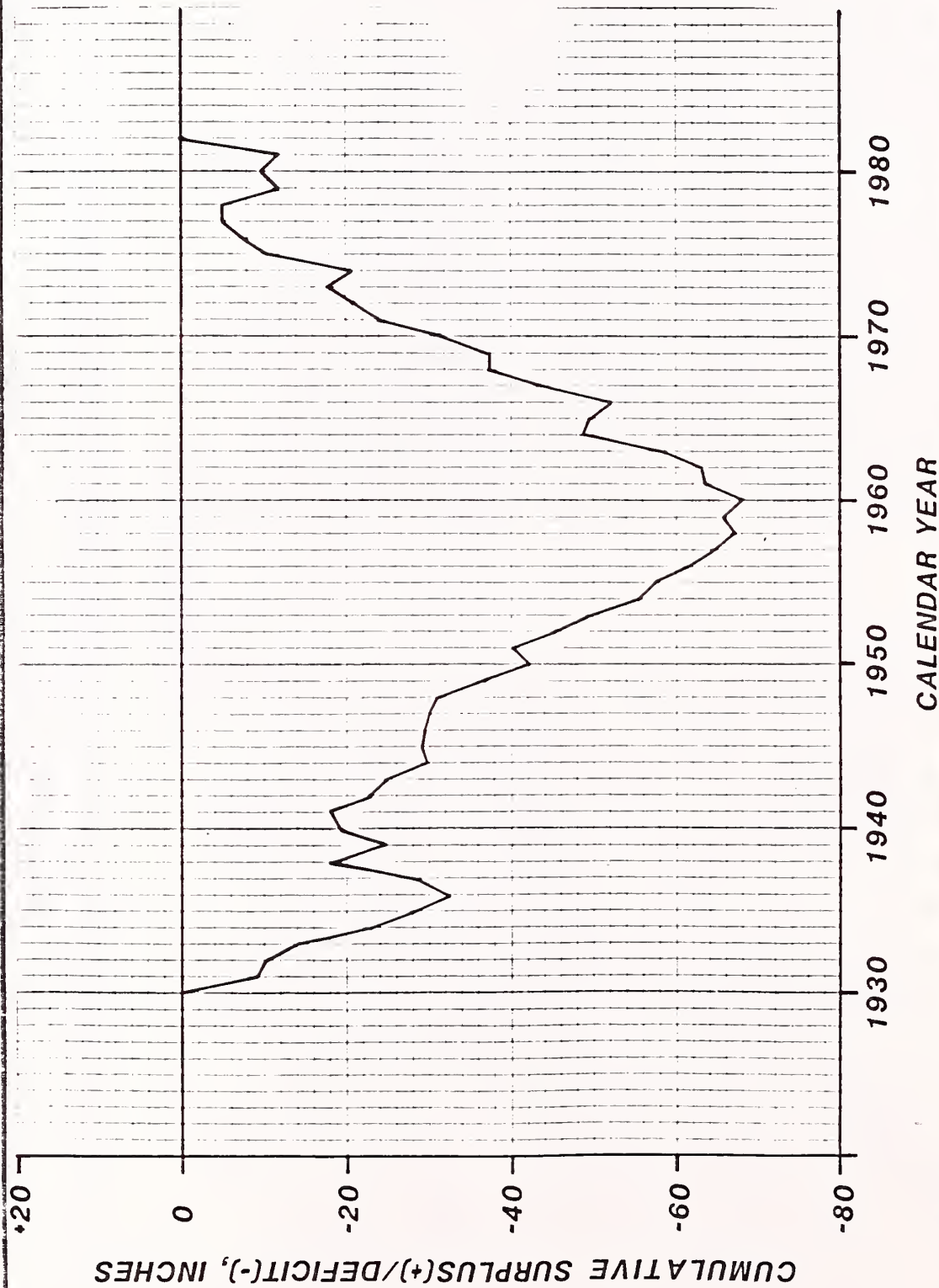
CUMULATIVE SURPLUS/DEFICIT CURVE EXTENDED HEBGEN DAM PRECIPITATION: 1889-1982

8M087.113

NOVEMBER 1983

FIGURE 7

H&M ASSOCIATES
ENGINEERS — PLANNERS

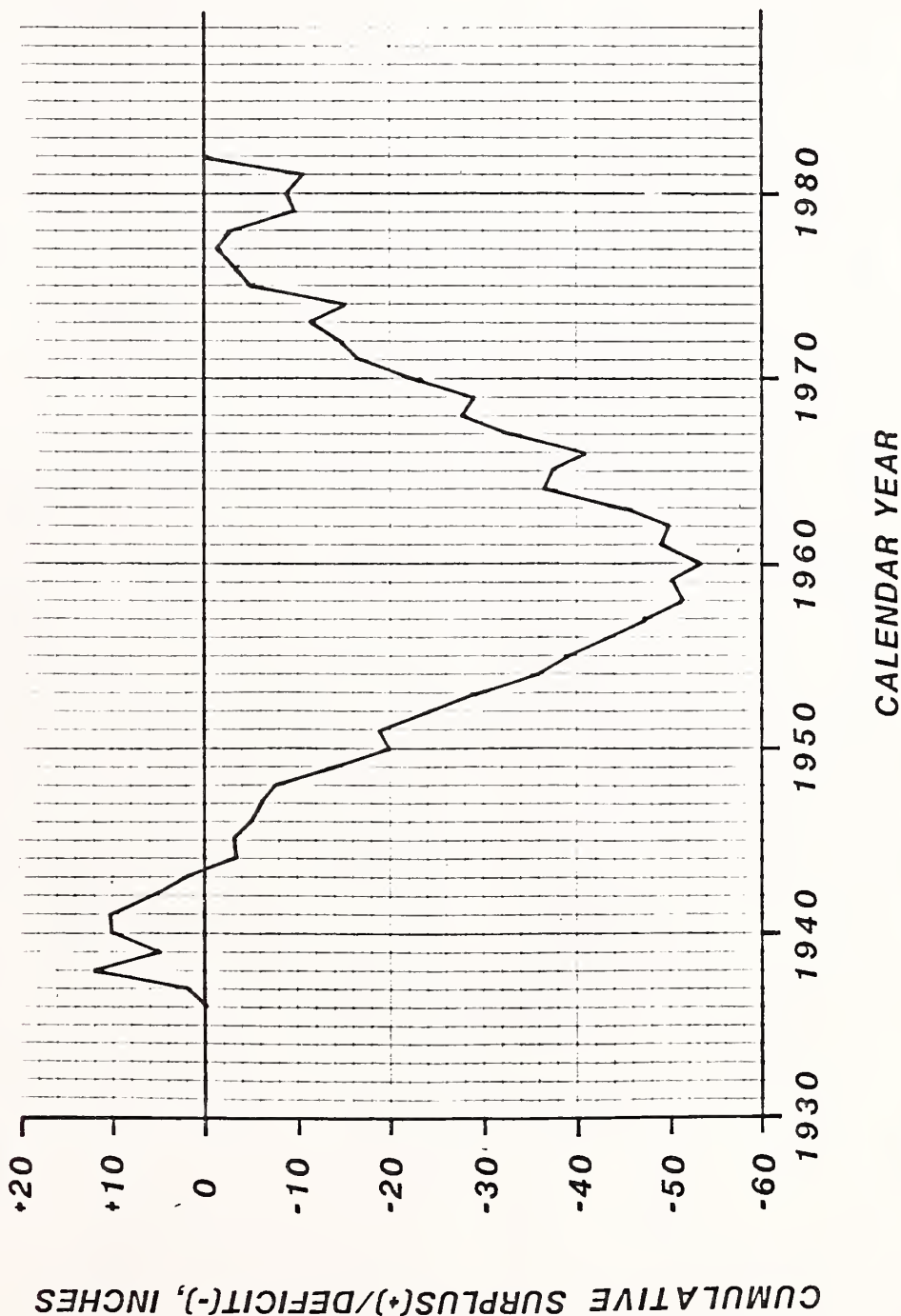


MIDDLE CREEK DAM

CUMULATIVE SURPLUS/DEFICIT CURVE HEGBEN DAM PRECIPITATION: 1931-1982

FIGURE 8

HKM ASSOCIATES
ENGINEERS - PLANNERS

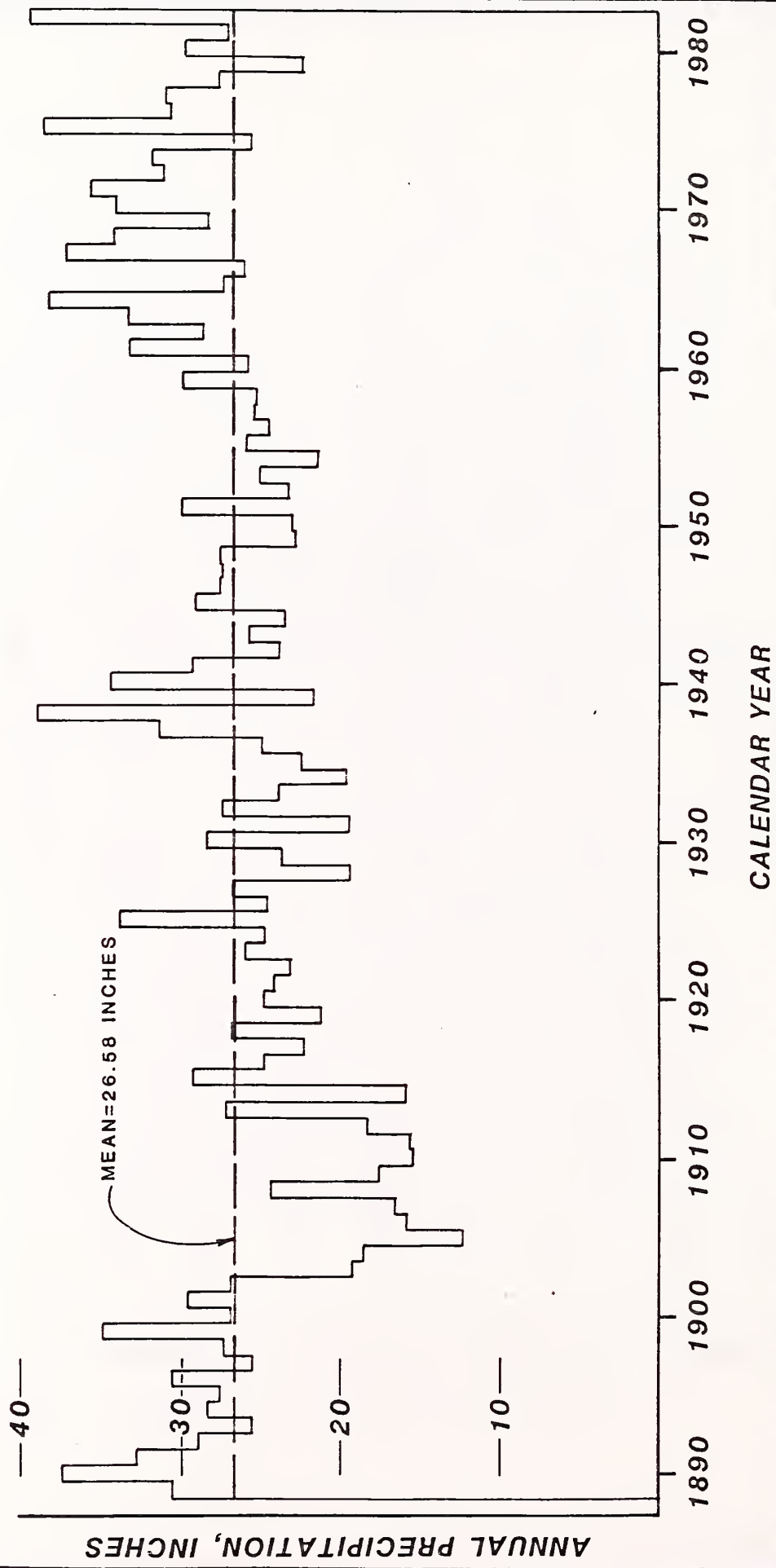


MIDDLE CREEK DAM

CUMULATIVE SURPLUS/DEFICIT PLOT HEBGEN DAM PRECIPITATION: 1937 - 1982

FIGURE 9

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MIDDLE CREEK DAM
ANNUAL PRECIPITATION PLOT
HEGBEN DAM EXTENDED TO 1889-1982

FIGURE 10
HKA ASSOCIATES
ENGINEERS — PLANNERS

NOVEMBER 1983

8M087.113

TABLES

Table 1

Drainage Area Summary

<u>Description</u>	<u>Drainage Area, sm</u>
East Fork Hyalite Creek above Gage (#41H01000)	8.4
West Fork Hyalite Creek above Gage (#41H01500)	11.0
Drainage Area below Gages but above Middle Creek Dam	7.6
Hyalite Creek above Middle Creek Dam	27.0
Hyalite Creek above Gage near Ranger Station (#06500000)	48.2

Table 2

Area-Altitude Summary
for
Middle Creek Dam Watershed

<u>Elevation Zone, ft. NGVD</u>	<u>Incremental Area, sm</u>	<u>Accumulated Area, sm</u>	<u>Incremental Area as a Percent of the Total, percent</u>
6700-7000	2.5	2.5	9
7000-8000	8.5	11.0	31
8000-9000	9.0	20.0	32
9000-10,000	7.0	27.0	27
10,000-10,300	1.0	27.0	1

Table 3

Streamgage Index

<u>Gage Name</u>	<u>Gage Number</u>	Drainage <u>Area, sm</u>	<u>Period of Record</u> ^{1/}
East Fork of Hyalite Creek	41H01000	8.4	1975 - present
West Fork of Hyalite Creek	41H01500	11.0	1966 - 74 ^{2/} 1975 - present
Hyalite Creek at Hyalite Ranger Station	06500000	48.2	1895 - 96, 1897, 1898 - 1900, 1902, 1903, 1904, 1934 - present
East Gallatin River at Bozeman	06048000	148	1939 - 61
Gallatin River near Gallatin Gateway	06043500	825	1889 - 94, 1930 - 69, 1971 - 81
Gallatin River at Logan	06052500	1795	1893 - 1905, 1928 - present

Notes:

^{1/} Given as water years. Present means 1982.

^{2/} Period when the SCS serviced the station.

TABLE 4

Monthly Streamflows for Hyalite Creek at Hyalite Ranger Station
(Historic Records, Total Record Period)

MONTHLY STREAMFLOWS

FILE -- 06050000														
SITE -- HYALITE CR. (MIDDLE CR. NEAR BOZEMAN) AT HYALITE RANGER STA.														
UNIT -- AC-FT														
NOTE -- ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE														
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL	
1895	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	3566	2375	+ 3566 2375	
1896	3136	2737	2450	1855	1438	1537	1954	5903	17256	10084	2705	2380	+ 53465	
1897	2337	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 53465	
1898	*****	*****	*****	*****	*****	*****	4864	10883	24159	13589	4562	4457	+ 53465	
1899	4544	3863	3639	3074	3055	4612	5355	9285	29932	20559	6383	3614	+ 97820	
1900	2937	*****	*****	*****	*****	*****	*****	*****	15056	5472	3382	2856	+ 97820	
1901	2951	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1902	*****	*****	*****	*****	*****	*****	*****	9039	15055	7133	4564	2499	+ 97820	
1903	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1904	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	2380	+ 97820	
1905	2530	2320	1840	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1906	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1907	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1908	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1909	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1910	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1911	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1912	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1913	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1914	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1915	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1916	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1917	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1918	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1919	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1920	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1921	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1922	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1923	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1924	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1925	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1926	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1927	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1928	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1929	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1930	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1931	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1932	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1933	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1934	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	+ 97820	
1935	1170	1010	708	599	637	764	1100	6590	13910	7230	2520	1470	+ 37708	
1936	1310	1100	905	904	3300	1830	1530	1260	27023	1260	1530	1260	+ 27023	
1937	1300	1130	873	910	636	9430	8460	1570	31330	1570	31330	1570	+ 31330	
1938	1350	1040	851	893	742	9330	8170	2260	34832	2260	34832	2260	+ 34832	
1939	1710	1450	1350	1170	750	1070	7770	2030	35033	2030	35033	2030	+ 35033	
1940	1470	1110	1020	1120	841	1870	10440	2070	33551	2070	33551	2070	+ 33551	
1941	1610	1170	1070	1270	1050	1220	1900	2780	31470	2780	31470	2780	+ 31470	
1942	3250	2070	1900	1510	1010	1230	4050	2140	45940	2140	45940	2140	+ 45940	
1943	1830	1500	1270	1200	1160	1060	7770	2820	47060	2820	47060	2820	+ 47060	
1944	1830	1740	1450	1120	1100	1050	1300	2750	44490	13970	7530	2670	+ 44490	

TABLE 4 Continued

49,110.7

SUM OF MONTHLY MEANS

TABLE 5

Monthly Streamflows for Hyalite Creek at Hyalite Ranger Station
(Unregulated Flows, Total Record Period)

MONTHLY STREAMFLOWS

FILE -- HYAUNREG
SITE -- HYALITE CR. (MIDDLE CR. NEAR ROZEMAN) AT HYALITE RANGER STA.
UNIT -- AC-FT
NOTE -- ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE

11/18/83

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL
1895	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	3556	2975	*****
1896	3136	2737	2460	1945	1438	1537	1954	5903	17256	10084	2705	2380	53445
1897	2337	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1898	*****	*****	*****	*****	*****	*****	4844	10383	24159	13589	4552	4457	*****
1899	4544	3368	3699	3074	3055	4512	5355	9285	23932	20559	6333	3414	97820
1900	2987	*****	*****	*****	*****	*****	*****	*****	15056	5472	3392	2856	*****
1901	2951	*****	*****	*****	*****	*****	*****	9039	15055	7133	4564	2499	*****
1902	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1903	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1904	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1905	2580	2320	1840	*****	*****	*****	*****	*****	*****	*****	*****	2380	*****
1906	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1907	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1908	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1909	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1910	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1911	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1912	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1913	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1914	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1915	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1916	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1917	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1918	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1919	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1920	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1921	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1922	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1923	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1924	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1925	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1926	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1927	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1928	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1929	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1930	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1931	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1932	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1933	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1934	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1935	1170	1010	708	599	637	764	1100	6590	13910	7230	2520	1470	37708
1936	1310	1100	1050	937	690	906	3900	7270	5290	1380	1530	1260	27023
1937	1300	1130	1030	991	636	973	1240	8460	9430	3280	1570	1430	31330
1938	1350	1040	851	899	742	980	2100	8170	10930	3980	2260	1520	34832
1939	1380	1460	1350	1170	833	1070	2570	8590	7770	4710	2080	1650	35033
1940	1470	1110	1020	1120	750	841	1870	10440	12020	4160	2070	1680	33551
1941	1510	1170	1070	1270	1060	1220	1900	6790	7370	2780	1820	3430	31490
1942	3250	2070	1900	1510	1010	1230	4050	7340	10830	8040	2740	1360	45940
1943	1930	1590	1270	1200	1160	1060	4050	7770	14190	8260	2820	1860	47050
1944	1830	1740	1250	1120	1100	1060	1300	8060	13970	7630	2750	2670	44490

TABLE 5 Continued

Monthly Streamflows for Hyalite Creek at Hyalite Ranger Station
(Unregulated Flows, Total Record Period)

MONTHLY STREAMFLOWS														
FILE -- HYAUNREG														
SITE -- HYALITE CR. (MIDDLE CR. NEAR BOZEMAN) AT HYALITE RANGER STA.														
UNIT -- AC-FY														
NOTE -- ANY MONTH WITH ##### INDICATES NO DATA AVAILABLE														
	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
1	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
2	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
3	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
4	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
5	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
6	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
7	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
8	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
9	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
10	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
11	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
12	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
13	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
14	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
15	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
16	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
17	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
18	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
19	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
20	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
21	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
22	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180
23	2300	2030	2030	1790	1610	1310	1100	1020	1230	8330	11930	9250	2780	2180

TABLE 6

Monthly Streamflows for Hyalite Creek at Hyalite Ranger Station
(Unregulated Flows, Extended Record Period)

MONTHLY STREAMFLOWS

FILE -- HYUREGE3

SITE -- HYALITE CR. (MIDDLE CR. NEAR BOZEMAN) AT HYALITE RANGER STA.

UNIT -- AC-FT

NOTE -- ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE

11/02/83

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL
1883	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1890	2002	1933	1995	1620	1475	1620	2208	9967	12105	6637	2117	2163	*****
1891	2888	2415	2025	1995	1811	2231	2392	9051	11571	7317	3630	2873	48125
1892	2873	2392	2155	2132	2002	2163	2163	7103	20276	12029	3630	2766	50152
1893	3606	2789	2697	2315	1941	1880	2216	6760	17832	6217	3033	2781	63197
1894	2819	2201	1935	1666	1559	1575	2682	13861	18367	6537	3690	2873	54067
1895	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	59325
1896	3136	2737	2460	1845	1438	1537	1964	5903	17256	10084	2705	2380	*****
1897	2337	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	53445
1898	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1899	4544	3868	3689	3074	3055	4612	5355	10883	24159	13589	4562	4457	*****
1900	2987	*****	*****	*****	*****	*****	*****	*****	29982	20559	6383	3414	97820
1901	2951	*****	*****	*****	*****	*****	*****	*****	16066	5472	3382	2855	*****
1902	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1903	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1904	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1905	2530	2320	1840	*****	*****	*****	*****	*****	15055	7133	4564	2499	*****
1906	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1907	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1908	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1909	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1910	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1911	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1912	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1913	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1914	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1915	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1916	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1917	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1918	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1919	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1920	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1921	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1922	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1923	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1924	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1925	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1926	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1927	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1928	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1929	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1930	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1931	2537	1704	1521	1055	1468	1666	2399	6973	9661	4644	3079	2140	*****
1932	1231	1513	1391	1333	1361	1361	1712	9051	8134	2346	1506	1177	32436
1933	1842	1590	1368	1452	1239	1330	1849	9051	17451	5561	2453	1987	46524
1934	1595	1479	1478	1506	1322	1502	2725	4913	13938	4013	2331	1972	37258
1935	1170	708	599	637	637	637	764	1100	3040	1735	1381	964	23640
1936	1310	1100	1050	837	690	906	3900	7270	13910	7230	2520	1470	37708
1937	1300	1130	1030	891	636	873	1240	8460	9430	3280	1570	1430	31330
1938	1350	1040	861	899	742	980	2100	8170	10980	3980	2260	1520	34882

TABLE 6 Continued

Monthly Streamflows for Hyalite Creek at Hyalite Ranger Station
(Unregulated Flows, Extended Record Period)

[illegible]

TABLE 7

Monthly Streamflows for Hyalite Creek at Hyalite Ranger Station
(Unregulated, 1931-82)

MONTHLY STREAMFLOWS

11/02/83														
FILE -- HYUREGE24	YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL
SITE -- HYALITE CR. (MIDDLE CR. NEAR SOZEMAN) AT HYALITE RANGER STA.	1931	2537	1704	1521	1055	1453	1665	2399	6973	8134	2346	1506	1177	32486
UNIT -- AC-FT	1932	1231	1513	1483	1391	1330	1361	1712	9051	17451	5561	2453	1987	46524
NOTE -- ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE	1933	1842	1590	1368	1452	1239	1330	1849	4339	13938	4018	2331	1972	37268
	1934	1595	1479	1478	1506	1322	1502	2725	4913	3040	1735	1391	964	23640
	1935	1170	1010	708	599	637	764	1100	6590	13910	7230	2520	1470	37708
	1936	1310	1100	1060	837	690	905	3900	7270	5280	1380	1530	1260	27023
	1937	1300	1130	1030	991	696	873	1240	8460	9430	3280	1570	1430	31330
	1938	1350	1040	861	899	742	980	2100	8170	10930	3980	2260	1520	34882
	1939	1780	1460	1350	1170	833	1070	2570	8590	7770	4710	2080	1650	35033
	1940	1470	1110	1020	1120	750	841	1870	10440	12020	4160	2070	1680	38551
	1941	1610	1170	1070	1270	1050	1230	4050	7340	10830	8040	2740	1960	31490
	1942	3260	2070	1900	1510	1010	1060	4050	7770	14190	8260	2820	1860	47060
	1943	1830	1590	1270	1200	1160	1060	4050	8060	13970	7530	2750	2670	44490
	1944	1830	1480	1260	1120	1100	1020	1280	8330	11990	9250	2780	2180	44000
	1945	2300	1500	1170	1100	1100	1480	4630	6920	9200	5610	2950	2290	41430
	1946	2080	1790	1610	1410	1410	994	2280	12640	14280	9860	3760	3310	54410
	1947	2060	1900	1370	1040	916	1480	7290	17860	15830	6390	4590	3030	65920
	1948	2780	1940	1860	1810	1060	920	3120	8710	9830	4180	2130	2170	40100
	1949	2510	2230	1840	1210	1250	1160	1810	6090	12170	7680	3380	2330	41830
	1950	2030	1510	1390	1120	1160	653	3150	10450	6850	5260	2610	2080	33155
	1951	2060	1810	1740	1500	992	1120	3960	12460	14140	5850	2970	1980	49740
	1952	2050	1360	1220	1570	1060	1099	1930	5650	13500	7570	2370	2000	40930
	1953	1630	1251	1260	1165	1455	1295	2060	7880	10620	6320	2940	1630	40632
	1954	1850	1480	1543	899	1295	1575	1231	8190	13420	6150	2630	1440	40539
	1955	1340	1149	1631	1298	1021	11039	2760	7070	11920	3290	1950	1860	36253
	1956	1720	1128	1373	1150	873	1159	1400	7320	15670	5660	2190	1950	41686
	1957	1730	1392	1330	979	910	1121	2010	11900	9040	4490	2620	1790	33724
	1958	1710	1350	1320	1290	1083	1150	2360	9290	19830	8990	2940	2560	53665
	1959	1550	1470	1320	1270	935	1150	3490	7470	13820	5940	2910	1760	45830
	1960	2640	2110	1570	1330	1310	1480	3490	7470	13820	5940	2910	1760	45830
	1961	1530	1400	993	707	1014	1155	1810	6960	9450	2330	1750	1880	30979
	1962	2780	1630	1280	1123	1099	1270	4840	9390	12160	7210	3690	2490	48962
	1963	2200	1053	1860	1180	1307	1490	2740	11760	13930	5890	2960	2130	49500
	1964	1800	1800	995	710	798	929	2770	11590	15720	10050	3750	2530	53032
	1965	2280	1510	2140	1590	1210	1580	2380	10780	19430	12150	4240	3490	63890
	1966	2701	2108	1671	1430	1293	1379	2440	11430	10600	5400	3120	1940	45512
	1967	2050	1370	1563	1226	1041	1275	1510	10450	18100	10050	3040	2160	53835
	1968	2540	2130	1840	1650	1350	1610	1930	11390	18680	13030	6230	4550	66940
	1969	3930	2140	1600	1770	1221	1590	4710	17910	14760	10340	3400	2680	65101
	1970	2430	1640	1690	1410	1430	1490	1330	17730	25240	11750	4450	3560	74250
	1971	3080	2270	1560	1405	1380	1450	2130	12980	18590	11940	4620	3340	65055
	1972	2930	1980	1376	1371	1342	2080	2530	9010	12840	5880	2080	2290	45709
	1973	2310	1580	1280	972	1147	1655	1248	13500	15360	7310	2670	2780	51752
	1974	2130	2150	1450	1740	1174	1180	2930	10300	23390	10240	3470	2710	62934
	1975	2200	1650	1250	1630	1470	1700	1320	5623	22010	17480	3840	3150	63320
	1976	2980	2630	2130	1790	1650	1670	3240	15350	13970	9620	3650	2910	61610
	1977	2790	1780	1500	1323	1272	1714	4110	8900	10420	3650	2240	2030	41729
	1978	2970	1730	1630	1430	1310	1760	3820	11910	12230	9620	3360	3420	55190
	1979	2560	2040	1500	1440	1190	1540	2280	9770	14110	6290	3150	2280	43150
	1980	1620	1520	1310	1250	1150	1410	3880	11840	10080	4520	2230	1980	42790

TABLE 7 Continued

MONTHLY STREAMFLOWS

TABLE 8

Gallatin River near Gallatin Gateway
(Historic Records, Total Record Period)

MONTHLY STREAMFLOWS

FILE -- 06043000

SITE -- GALLATIN RIVER NEAR GALLATIN GATEWAY

UNIT -- AC--FT

NOTE -- ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE

11/21/83

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL
1889	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1890	24700	23300	24400	19700	17300	19700	27400	129000	157000	85400	25200	26900	*****
1891	35300	30100	25000	24400	22200	27700	23800	117000	150000	94300	45800	34700	512000
1892	36100	29300	25700	26400	24700	24400	25800	91500	150000	156000	58900	43700	539500
1893	45700	35000	33800	28300	23300	23100	27500	87000	232000	79300	33200	34900	809200
1894	35400	27300	24600	20300	18900	19100	33600	130000	239000	85400	45800	36100	689800
1895	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	765500
1896	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1897	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1898	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1899	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1900	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1901	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1902	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1903	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1904	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1905	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1906	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1907	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1908	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1909	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1910	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1911	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1912	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1913	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1914	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1915	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1916	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1917	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1918	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1919	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1920	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1921	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1922	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1923	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1924	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1925	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1926	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1927	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1928	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1929	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1930	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1931	31700	20800	18400	12300	17700	20300	29900	89300	105000	29200	18200	13900	407200
1932	14600	18300	17900	16700	15900	16300	20900	117000	227000	71300	30600	24500	591000
1933	22400	19300	15400	17500	14700	15900	22700	55300	181000	51100	29000	24300	463800
1934	19370	17350	17830	13200	15790	18150	34160	42920	38230	21200	16570	15370	295600
1935	16350	14300	13180	13380	12240	12540	18720	54990	158000	59320	25240	19010	420120
1936	18560	16060	14800	14360	12940	13320	34810	127000	90260	31890	24520	19020	413050
1937	18050	14690	14060	14630	13190	13430	15650	92360	107700	45190	23090	18110	390160
1938	17890	15900	14740	14350	12630	13960	22170	84430	187600	75810	32910	23090	515530

TABLE 8 Continued

MONTHLY STREAMFLOWS

589,003-9

TABLE 9
Gallatin River at Logan
(Historic Records, Total Record Period)

MONTHLY STREAMFLOWS

11/21/83													
FILE -- 06052300													
SITE -- GALLATIN RIVER AT LOGAN													
UNIT -- AC--T													
NOTE -- ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE													
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL
1933	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1934	36900	29300	27700	24500	25030	35000	49300	176000	255000	67600	27700	31500	737100
1935	43000	44600	43200	49200	44400	48300	63100	148000	151000	64600	29500	43000	784400
1936	43200	42400	37500	41800	39100	43000	42400	67500	268000	75000	42900	40600	782400
1937	41900	40500	43300	43000	36100	40000	58900	232000	173000	42700	27500	30300	807600
1938	37900	40100	33700	43000	33900	42800	61200	133000	296000	57400	22800	43900	856700
1939	51300	42100	49200	43000	33200	39200	76300	121000	325000	105000	41900	30300	957600
1940	34900	42300	49200	55300	55500	61500	67900	192000	134000	20200	21000	28300	763100
1941	37300	41700	33900	36900	33300	36900	45100	239000	122000	17600	11600	24000	735300
1942	33400	33800	35900	32500	30600	41700	36600	133000	165000	53400	25200	23700	645900
1943	35300	35300	35200	43000	44300	48500	51900	93200	210000	72500	22600	24900	724600
1944	43800	41700	36900	28400	30100	29400	69600	170000	232000	79300	22000	32400	815600
1945	45400	44000	50700	45500	35100	35700	32900	58700	132000	31700	13800	16600	543200
1946	30700	36700	35900	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1947	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1948	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1949	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1950	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1951	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1952	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1953	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1954	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1955	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1956	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1957	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1958	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1959	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1960	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1961	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1962	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1963	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1964	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1965	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1966	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1967	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1968	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1969	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1970	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1971	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1972	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1973	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1974	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1975	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1976	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1977	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1978	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1979	54700	52900	46900	40300	23900	48900	53100	101000	165000	46700	19500	29700	638500
1980	41600	44400	45100	33200	43000	42700	63700	76300	57700	22100	32100	36200	538700
1981	55200	44500	40100	38100	30000	47500	51700	71900	88100	11500	14400	18000	511200
1982	24900	32700	34400	25300	31100	40600	44300	117000	152000	37300	18400	26700	592700
1983	39000	49000	37500	38700	25800	39500	42300	76900	137000	14800	16600	27400	544600
1984	39970	45320	40580	39370	35570	38950	25530	10760	16650	9960	10290	14190	328250
1985	20470	19500	28540	27670	27540	34020	37490	43960	103200	19190	16350	19690	395640
1986	25130	36510	36520	33330	22140	45670	59250	124400	41150	10190	13750	19360	469240
1987	23140	28920	30630	25100	35370	35140	47310	60440	84030	19750	15340	20390	447920
1988	24440	26630	34530	33540	31050	34520	45520	115300	163030	58300	17340	20900	509770
1989	40500	50520	45190	40140	24470	53080	53730	97350	80630	26340	18340	25310	596270
1990	34350	35500	33860	32930	34210	45200	57930	132400	117600	18650	20090	26380	596350
1991	33450	35750	39940	38010	33510	43350	42740	65010	59400	20220	21960	48290	480700
1992	60530	53340	52490	40270	38780	46500	96970	128500	193300	51680	21470	36310	920190

TABLE 9 Continued
Gallatin River at Logan
(Historic Records, Total Record Period)

[illegible]

SUM OF MONTHLY MEANS

TABLE 11
East Fork of Hyalite Creek (1975-83)

MONTHLY STREAMFLOW													
FILE --	41HJ1000												
SITE --	EAST FORK HYALITE CREEK												
UNIT --	AC-FT												
NOTE --	ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE												
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL
1975	547	456	359	330	250	235	232	1160	6420	5460	976	551	15986
1976	605	417	311	205	67	61	373	2410	3970	2350	809	517	12100
1977	459	191	109	53	56	50	595	1590	2950	1040	510	500	8118
1978	649	417	307	229	417	253	524	1640	3630	2570	634	553	11745
1979	412	274	228	264	229	271	403	2200	3560	1660	750	650	10901
1980	507	369	348	267	223	171	770	2560	2720	1060	543	544	10102
1981	359	354	371	300	98	119	624	3590	3590	1650	383	10754	
1982	432	306	271	251	151	134	303	1570	3560	3010	936	859	11833
1993	956	579	473	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
MEAN	547	373	309	239	162	169	452	1946	3806	2350	729	569	11567
S.D.	179	112	102	82	32	82	176	1439	1131	1439	171	138	2532
COEF. VAR.	.327	.300	.330	.346	.507	.490	.331	.266	.297	.612	.235	.242	.218
PERCENT OF ANNUAL MEAN	4.7%	3.2%	2.7%	2.0%	1.4%	1.4%	4.0%	16.7%	32.6%	20.1%	6.2%	4.9%	
SUM OF MONTHLY MEANS													11,564.5

TABLE 12

FILE -- SC5MDNRC

SITE -- WEST FORK HYALITE CREEK

UNIT -- AC-FY

NOTE -- ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE

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YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL
1950	100	100	100	100	100	100	100	100	100	100	100	100	1000
1951	100	100	100	100	100	100	100	100	100	100	100	100	1000
1952	100	100	100	100	100	100	100	100	100	100	100	100	1000
1953	100	100	100	100	100	100	100	100	100	100	100	100	1000
1954	100	100	100	100	100	100	100	100	100	100	100	100	1000
1955	100	100	100	100	100	100	100	100	100	100	100	100	1000
1956	100	100	100	100	100	100	100	100	100	100	100	100	1000
1957	100	100	100	100	100	100	100	100	100	100	100	100	1000
1958	100	100	100	100	100	100	100	100	100	100	100	100	1000
1959	100	100	100	100	100	100	100	100	100	100	100	100	1000
1960	100	100	100	100	100	100	100	100	100	100	100	100	1000
1961	100	100	100	100	100	100	100	100	100	100	100	100	1000
1962	100	100	100	100	100	100	100	100	100	100	100	100	1000
1963	100	100	100	100	100	100	100	100	100	100	100	100	1000
1964	100	100	100	100	100	100	100	100	100	100	100	100	1000
1965	100	100	100	100	100	100	100	100	100	100	100	100	1000
1966	100	100	100	100	100	100	100	100	100	100	100	100	1000
1967	100	100	100	100	100	100	100	100	100	100	100	100	1000
1968	100	100	100	100	100	100	100	100	100	100	100	100	1000
1969	100	100	100	100	100	100	100	100	100	100	100	100	1000
1970	100	100	100	100	100	100	100	100	100	100	100	100	1000
1971	100	100	100	100	100	100	100	100	100	100	100	100	1000
1972	100	100	100	100	100	100	100	100	100	100	100	100	1000
1973	100	100	100	100	100	100	100	100	100	100	100	100	1000
1974	100	100	100	100	100	100	100	100	100	100	100	100	1000
1975	100	100	100	100	100	100	100	100	100	100	100	100	1000
1976	100	100	100	100	100	100	100	100	100	100	100	100	1000
1977	100	100	100	100	100	100	100	100	100	100	100	100	1000
1978	100	100	100	100	100	100	100	100	100	100	100	100	1000
1979	100	100	100	100	10								

1966	1020	1060	992	355	641	675	655	2040	8300	9920	2050	1070	29199	940	23421	1530	940	1530	940	23421	1530	940	23421	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530	940	1530
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SUM OF MONTH

SUM OF MONTHLY MEANS

21,763.3

TABLE 13

MONTHLY STREAMFLOW

TABLE 14
East and West Forks of Hyalite Creek (1931-82)

MONTHLY STREAMFLOW													
FILE	-- HCUSGAGE												
SITE	-- SUM OF S. & W. FK HYALITE CREEK GAGES												
UNIT	-- AC-FT												
NOTE	-- ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE												
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL
1931	1480	925	805	495	759	901	1398	4428	5200	1353	795	576	19116
1932	612	799	779	713	678	698	932	5809	11392	3490	1424	1114	28445
1933	1018	851	703	759	617	673	1023	2679	9057	2464	1343	1104	22235
1934	854	777	775	795	672	792	1605	3059	1814	947	712	434	13237
1935	571	465	254	192	217	302	525	4174	9039	4599	1469	771	22588
1936	664	525	478	350	252	395	2386	4626	3303	1043	811	631	15435
1937	658	545	478	386	256	374	618	5417	6051	1974	837	744	18348
1938	691	485	366	391	287	445	1139	5224	7031	2439	1236	804	20708
1939	977	764	631	571	347	505	1502	5503	4958	2924	1176	890	20808
1940	771	531	472	533	292	353	1037	6732	7783	2559	1170	910	23148
1941	854	571	505	538	498	605	1057	4307	4632	1541	1003	2073	19454
1942	1950	1170	1057	797	455	611	2486	4672	6932	5137	1615	1096	23058
1943	1010	951	638	591	565	498	2486	4958	9225	5284	1658	1030	28804
1944	1010	950	631	538	525	498	658	5151	9079	4365	1621	1568	27094
1945	1322	791	571	525	525	472	644	5330	7753	5942	1641	1243	26759
1946	1176	983	854	731	731	777	2904	4393	5908	3522	1754	1315	25059
1947	1163	1057	704	485	403	454	1309	8195	9285	6347	2293	1934	33689
1948	1641	1083	1030	997	498	777	4639	11664	10315	4041	2844	1809	41337
1949	1462	1276	1017	598	625	405	1867	5583	6327	2572	1209	1236	24177
1950	1143	797	718	533	555	565	997	3841	7882	4393	2040	1342	25326
1951	1163	997	950	791	453	538	1837	6739	4346	3290	1528	1176	23568
1952	1156	693	605	837	438	524	2426	8075	9192	3582	1768	1110	30585
1953	877	625	631	563	751	524	1110	3549	8766	4825	1369	1123	24728
1954	1023	819	819	391	654	841	1163	5031	6352	4393	1748	877	24559
1955	684	557	878	656	472	484	612	5237	8713	3381	1542	751	24467
1956	937	543	706	558	374	564	1628	4493	7716	1980	1090	1030	21619
1957	964	719	678	444	339	561	724	4559	10208	3556	1249	1090	25231
1958	930	691	671	651	514	539	1130	7703	5802	2778	1535	983	23927
1959	824	771	671	638	415	558	1352	5963	12973	5769	1748	1495	33192
1960	1548	1195	837	678	654	777	2113	4759	8979	3742	1728	964	27995
1961	811	724	454	264	468	561	997	4420	6074	1342	957	1043	18115
1962	1641	877	644	540	524	639	3011	6035	7876	4586	2246	1449	30067
1963	1256	494	1030	579	662	784	1615	7610	9052	3709	1761	1209	29759
1964	930	724	448	266	317	411	1635	7497	10242	6473	2293	1475	32771
1965	1309	797	1216	851	654	844	1376	6958	12707	8534	2612	2113	39381
1966	1589	1195	904	744	653	710	1415	7390	6839	3383	1857	1083	37772
1967	1156	833	609	609	486	641	797	6739	11824	6473	1814	1229	33305
1968	1432	1209	1017	890	698	864	1076	7364	12209	8454	3934	2818	42015
1969	2439	1215	857	970	605	351	2924	11697	9604	6666	2053	1575	41457
1970	1409	884	917	731	777	784	711	11578	16569	7603	2751	2160	46874
1971	1841	1302	831	723	844	931	1209	8421	12149	7729	2854	2014	40763
1972	1741	1110	708	705	686	1176	1475	5782	8328	3702	1176	1316	27905
1973	1329	910	644	440	436	894	637	8765	10002	4652	1568	1641	31319
1974	1249	1223	757	950	574	578	1781	6639	15339	6500	2100	1595	39385
1975	1567	1315	1271	1185	831	911	837	3200	14720	15380	3036	1621	45185
1976	1675	1239	970	759	573	552	1078	6860	10430	7530	2399	1457	35521
1977	1403	817	659	573	428	335	1595	4570	8490	2560	1276	1250	23951
1978	1492	959	727	674	640	690	1154	4270	9620	8930	2094	1505	32745
1979	1047	941	807	862	635	833	960	5760	10430	4840	1586	1383	30134
1980	1697	1499	1578	1201	741	652	2350	7440	7790	2880	1473	1574	30875

TABLE 14 Continued

MONITORING STREAMFLOW

TABLE 15
Hyalite Creek Inflow to Reservoir (1931-82)

MONTHLY STREAMFLOW

FILE -- HCFINAL	11/02/83												
SITE -- MIDDLE CREEK DAM INFLOW													
UNIT -- AC-FT													
NOTE -- ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE													
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL
1931	1901	1126	979	602	935	1036	1639	5383	5328	1545	967	700	23264
1932	744	972	948	873	825	949	1134	7069	13854	4247	1733	1355	34617
1933	1238	1035	855	923	750	825	1244	3259	11022	2998	1634	1343	27133
1934	1039	944	944	967	817	943	1953	3722	2207	1152	856	528	16109
1935	694	555	321	233	264	367	638	5079	11000	5596	1787	938	27439
1936	808	533	606	425	306	481	2903	5623	4019	1269	986	767	18945
1937	800	463	531	469	311	455	752	6592	7376	2402	1018	905	22329
1938	840	590	445	475	349	541	1447	6357	8629	2968	1577	978	25201
1939	1189	929	840	694	422	614	1827	6697	6033	3558	1431	1083	25323
1940	938	645	574	645	355	423	1262	8192	9471	3114	1423	1107	28171
1941	1051	694	614	776	606	736	1236	5241	5710	1997	1220	2522	22458
1942	2385	1423	1286	969	565	743	3025	5685	8509	6251	1965	1333	34146
1943	1229	1035	776	719	687	606	3025	6033	11226	6430	2029	1253	35054
1944	1229	1156	767	654	638	606	800	6263	11049	5920	1972	1909	32973
1945	1608	942	694	638	638	574	793	6486	9447	7231	1997	1512	32577
1946	1431	1195	1051	889	889	945	3534	5346	7190	4286	2134	1501	30496
1947	1415	1286	856	590	490	552	1593	9973	11299	7724	2790	2426	40999
1948	1997	1318	1253	1213	606	945	5645	14195	12553	4917	3461	2200	50307
1949	1779	1552	1237	727	760	492	2272	6794	7699	3130	1471	1504	29423
1950	1391	969	873	654	637	687	1213	4674	9592	5960	2482	1633	30821
1951	1415	1213	1156	962	551	277	2296	8201	5289	4003	1859	1431	23657
1952	1406	849	736	1018	606	654	2952	9827	11186	4480	3721	1350	37221
1953	1067	760	767	691	926	637	1350	4319	10668	5372	1666	1366	30093
1954	1244	945	996	741	795	1023	1415	6122	8338	5346	2127	1067	29900
1955	832	677	1058	798	574	589	744	6373	10603	4723	1876	913	29776
1956	1140	660	859	679	455	686	1931	5467	9390	2409	1326	1253	26310
1957	1148	875	825	540	435	682	881	5670	12423	4327	1520	1326	30706
1958	1131	840	816	792	625	655	1375	9374	7061	3380	1868	1196	29119
1959	1002	938	816	776	505	679	1657	7263	15788	7020	2127	1819	40394
1960	1883	1455	1018	825	808	945	2571	5791	10927	4554	2102	1173	34057
1961	986	881	552	321	569	682	1213	5379	7332	1164	1269	22045	22045
1962	1997	1067	733	657	637	776	3664	7344	9585	5581	2733	1763	36591
1963	1528	601	1253	703	805	954	1965	9261	11016	4512	2143	1471	36216
1964	1204	881	545	323	385	500	1939	9123	12464	7877	2790	1795	33832
1965	1593	969	1479	1035	808	1027	1674	8467	15464	10385	3178	2571	43656
1966	1933	1454	1100	905	774	864	1722	8993	8323	4117	2272	1318	33798
1967	1406	856	1013	741	591	780	969	8201	14389	7377	2207	1495	40532
1968	1803	1471	1237	1083	849	1051	1309	8961	14858	10283	4787	3429	51132
1969	2968	1479	1042	1180	736	1035	3558	14235	11698	8112	2498	1916	50453
1970	1714	1075	1115	889	945	954	865	14090	20164	9252	3347	2628	57045
1971	2240	1584	1011	885	1027	1011	1471	10248	14785	9406	3485	2451	49608
1972	2118	1350	861	857	834	1431	1795	7036	10135	4505	1431	1601	33960
1973	1617	1107	783	535	530	1087	775	10668	12172	5661	1908	1997	33845
1974	1520	1488	921	1156	638	703	2157	8079	18667	8032	2555	1941	47931
1975	1937	1844	1546	1442	1084	1108	1079	3894	17914	18717	3694	1972	56207
1976	2038	1506	1130	923	637	671	1311	8348	12693	9164	2919	1773	43229
1977	1707	994	802	703	520	407	1941	5561	10320	3115	1552	1521	29148
1978	1815	1167	894	820	778	839	1404	5196	11707	10367	2536	1831	33850
1979	1274	1145	932	1049	772	1013	1168	7009	12754	5990	1930	1683	35673
1980	2065	1824	1920	1461	901	793	2859	9054	9480	3504	1792	1915	37574

TABLE 15 Continued

MONTHLY STREAMFLOW

Table 16

Climate Station Index

<u>Gage Name</u>	<u>Gage Number</u>	<u>Elevation, ft NGVD</u>	<u>Years of Record</u> ^{1/}	
			<u>Temp</u>	<u>Precip</u>
Bozeman, MT State Univ.	1044	4856	100	104
Hebgen Dam	4038	6489	64	67
Yellowstone Park	9905	6230	89	93
Lick Creek ^{2/}	10D13	6860	20 (1964-83, incomplete)	18 (1965-82, incomplete)
Shower Falls ^{2/}	10D16	8100	18 (1966-83, incomplete)	18 (1965-82, incomplete)

Notes:

^{1/} Includes up to calendar year end 1982 for all but the Snow Survey Stations.

^{2/} SCS Snow Survey Stations.

Hebgen Dam Precipitation (1887-1983)

MONTHLY PRECIPITATION

FILE -- HOPRECE
SITE -- HEBGEN DAM
UNIT -- INCHES
NOTE -- ANY MONTH WITH ##### INDICATES NO DATA AVAILABLE

11/16/83

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
1887	7.83	5.13	1.58	2.24	1.22	#####	#####	#####	#####	#####	#####	3.14	#####
1888	4.49	2.73	3.77	1.43	#####	#####	#####	#####	#####	#####	#####	8.89	30.35
1889	1.33	2.71	1.47	1.82	2.24	1.59	1.50	1.57	1.53	2.17	2.94	8.89	30.35
1890	6.94	6.90	5.37	2.24	2.78	1.84	1.88	2.57	1.17	2.49	1.44	1.73	37.40
1891	1.43	3.48	3.14	1.16	2.88	3.71	3.90	2.08	2.55	2.28	2.78	3.46	32.74
1892	2.24	2.86	3.71	1.82	2.83	2.30	1.97	1.57	2.42	1.70	2.69	2.93	28.93
1893	2.62	1.70	1.85	1.86	1.90	1.34	1.88	1.94	2.28	2.19	3.23	2.70	25.48
1894	2.62	2.00	3.04	2.66	3.01	3.75	1.88	2.55	1.63	1.79	1.14	2.19	28.25
1895	5.22	1.30	3.40	1.54	2.49	3.41	1.51	1.64	1.38	1.39	2.16	2.15	27.58
1896	2.96	2.84	3.33	2.15	4.42	1.65	2.86	1.33	1.98	1.06	4.48	1.41	30.46
1897	2.00	1.71	1.94	2.08	2.38	3.08	1.99	1.51	1.28	2.53	3.65	1.71	25.85
1898	1.28	2.08	2.24	1.85	2.73	3.37	2.02	2.82	1.80	3.00	2.38	1.60	27.16
1899	4.74	4.02	3.66	3.04	3.24	2.63	2.26	2.98	1.80	2.79	1.03	2.68	34.92
1900	1.80	2.47	3.78	2.71	3.15	2.04	1.71	1.26	1.77	2.08	2.04	2.04	26.34
1901	3.01	1.64	2.30	1.96	3.41	2.27	1.92	2.47	3.53	1.82	2.11	3.25	29.58
1902	1.35	1.54	3.18	2.90	2.41	2.66	3.03	1.54	1.30	1.18	3.09	1.76	26.93
1903	1.53	1.22	1.76	1.71	1.58	1.80	1.49	1.40	1.53	1.46	2.24	1.36	19.08
1904	1.83	2.33	3.65	1.85	2.16	1.17	1.67	1.18	.59	1.12	0.00	1.01	18.55
1905	.57	.34	1.31	.49	2.58	1.75	1.21	.66	1.02	.74	.90	.69	12.26
1906	1.37	.97	2.20	.71	2.56	1.79	.93	1.40	.93	.61	.36	2.11	15.94
1907	2.07	.43	3.01	.42	1.57	2.18	1.81	1.14	2.06	.81	.13	.88	16.56
1908	1.76	2.08	2.24	1.73	4.00	3.24	1.30	2.67	1.05	2.14	.17	1.43	24.20
1909	2.43	1.80	.27	.39	1.86	1.19	1.74	1.05	3.08	.61	1.87	1.15	17.44
1910	2.95	.56	.13	.76	3.08	.29	1.16	.24	1.69	1.65	1.92	1.07	15.40
1911	2.50	.50	.79	.54	2.55	2.57	1.12	.56	.94	1.20	1.07	1.01	15.55
1912	.95	.49	1.79	1.62	1.55	2.01	4.14	1.92	.47	2.16	.64	.40	18.13
1913	3.98	1.03	2.84	2.56	2.35	3.90	4.53	.79	1.35	1.89	1.23	.61	27.05
1914	2.26	2.11	.48	.63	1.34	4.26	1.39	0.01	1.36	1.75	.15	.17	15.90
1915	2.64	2.05	1.71	2.01	5.15	2.00	3.05	.95	3.53	.63	2.23	3.06	29.05
1916	3.63	1.91	2.50	.95	2.71	1.61	1.23	.68	1.04	2.84	2.25	3.41	24.75
1917	2.63	2.35	1.79	3.14	1.77	1.82	.32	.50	2.71	.38	.99	3.78	22.17
1918	4.24	2.40	2.31	1.37	1.55	2.37	3.58	1.65	3.01	2.70	.63	.85	26.75
1919	1.18	3.25	1.84	1.01	1.77	.09	.77	.74	3.15	3.76	1.70	1.80	21.06
1920	.93	1.35	3.23	2.36	3.19	2.46	1.18	1.45	2.39	2.53	1.64	2.09	24.79
1921	3.91	1.44	1.79	1.86	4.54	1.45	.78	1.79	1.12	.88	2.53	2.01	24.09
1922	2.84	2.74	2.39	2.11	2.25	1.10	1.65	3.47	.25	.40	.98	3.00	23.08
1923	2.66	1.25	1.90	2.71	1.94	4.06	3.66	2.03	.72	1.71	.84	2.50	25.97
1924	2.18	2.33	2.27	.91	1.00	1.00	3.22	.91	2.78	2.58	2.62	2.76	24.60
1925	3.58	2.56	1.40	2.37	2.33	3.69	1.82	1.17	3.04	1.73	6.28	3.74	33.70
1926	1.31	1.93	1.50	2.23	2.94	2.06	1.16	2.22	2.36	2.22	2.94	1.74	24.54
1927	1.98	2.60	1.11	.91	3.67	1.32	.47	1.89	1.75	2.71	5.46	2.90	26.76
1928	3.39	.70	2.42	1.34	.54	3.34	1.33	1.10	.28	1.59	1.63	1.67	19.33
1929	3.19	3.19	1.93	1.22	1.22	2.75	1.65	1.31	1.46	1.52	2.43	1.54	23.68
1930	3.14	3.05	1.31	2.36	1.32	1.84	1.93	4.40	2.75	3.29	1.89	1.00	28.27
1931	1.21	1.50	1.23	.57	1.50	1.52	.92	1.54	1.74	.84	3.20	3.57	19.34
1932	2.55	1.48	5.06	1.60	1.78	3.23	2.42	1.47	.35	1.12	2.91	3.09	27.25
1933	4.48	2.95	.98	1.70	2.24	1.54	.61	2.08	1.28	.94	1.04	4.14	23.87
1934	1.92	.65	2.16	1.06	.16	3.16	.57	.73	1.62	2.15	2.49	1.78	19.53
1935	2.40	.84	3.10	3.69	2.37	1.10	.55	.39	.72	2.70	2.70	1.78	22.38
1936	5.16	2.47	1.11	2.49	1.01	1.82	3.31	2.62	.97	.61	.54	2.82	24.92

TABLE 17 Continued

MONTHLY PRECIPITATION														
FILE --	HOPRECE													
SITE --	HEBSEN DAM													
UNIT --	INCHES													
NOTE --	ANY MONTH WITH ###.## INDICATES NO DATA AVAILABLE													
1937	3.44	3.56	3.56	3.56	2.16	.45	3.91	3.11	.91	1.53	1.41	3.51	3.69	31.22
1938	3.66	4.79	4.37	4.37	2.35	3.30	2.81	3.96	1.76	.34	6.22	2.81	2.10	39.86
1939	3.96	2.72	2.22	2.22	1.12	1.63	2.21	1.43	.34	1.34	2.35	.08	2.15	21.54
1940	3.18	5.33	3.36	3.36	2.93	1.26	2.78	2.16	.05	5.42	1.40	3.27	2.55	34.25
1941	1.54	1.30	1.20	1.02	1.02	4.01	3.61	2.38	2.60	3.34	1.39	3.27	2.79	29.18
1942	2.68	1.93	1.02	2.01	2.01	4.28	1.36	.35	.44	.71	1.77	3.92	3.23	23.82
1943	2.75	2.04	2.36	2.83	2.83	2.73	3.96	1.75	.86	.75	3.57	.78	1.27	25.70
1944	.66	3.02	2.34	.92	.92	2.95	5.98	1.16	.32	1.42	.53	2.91	1.34	23.44
1945	1.15	2.15	1.47	1.15	1.15	4.30	4.94	1.54	2.85	3.02	.56	3.48	3.33	29.00
1946	2.53	2.97	4.54	.75	.75	2.42	.67	1.54	.89	1.16	3.71	3.57	2.73	27.47
1947	1.92	1.50	1.77	1.10	1.10	2.15	4.55	1.08	1.15	3.17	2.46	4.80	1.67	27.31
1948	2.81	1.49	2.26	2.36	2.36	2.57	3.16	.96	1.20	1.68	.90	4.26	3.18	27.42
1949	3.03	1.17	.73	.87	.87	2.50	2.55	.69	.85	1.52	1.89	4.26	3.73	22.79
1950	2.62	2.20	3.36	.95	.95	1.24	2.01	2.12	1.23	1.07	2.53	1.74	1.79	22.90
1951	1.09	2.64	2.61	1.05	1.05	2.36	2.17	1.43	4.62	.13	3.25	2.17	5.59	29.91
1952	4.42	2.72	3.01	.31	.31	2.09	3.52	1.92	.65	.84	0.00	.75	2.90	23.12
1953	3.37	2.67	1.95	1.44	1.44	5.38	2.40	.30	.67	.55	.11	2.14	2.93	25.00
1954	3.44	1.54	1.54	1.95	1.95	.74	5.35	1.65	1.34	.50	.40	.92	1.91	21.21
1955	2.46	2.18	1.57	.95	.95	3.16	2.96	2.17	.66	.88	1.99	2.29	4.63	25.90
1956	3.21	2.00	1.22	1.78	1.78	2.97	.88	1.95	.77	1.71	4.03	1.64	2.44	24.39
1957	3.19	2.04	1.75	2.53	2.53	3.06	2.34	1.96	1.40	.35	2.38	1.63	2.77	25.34
1958	1.28	1.93	3.36	2.60	2.60	2.09	3.54	1.90	1.64	1.83	.65	2.28	2.00	25.09
1959	2.64	3.69	3.35	1.17	1.17	6.02	4.07	.58	.77	3.04	2.24	1.31	.96	29.93
1960	2.86	2.19	2.70	2.70	2.70	2.32	1.33	.51	2.48	.50	2.65	3.46	2.31	25.72
1961	.66	4.36	2.89	1.62	1.62	1.91	.96	2.24	4.50	4.26	3.61	2.74	3.30	33.04
1962	3.01	4.25	3.15	1.22	1.22	4.77	2.24	1.55	1.39	1.46	1.28	3.24	.90	28.45
1963	3.73	2.49	1.97	3.58	3.58	2.72	6.11	.54	.51	4.11	1.73	3.53	2.12	33.18
1964	3.44	2.36	4.00	2.93	2.93	2.44	7.50	1.12	1.83	.31	1.91	3.02	7.10	39.05
1965	6.72	1.17	.52	4.50	4.50	2.27	3.15	1.42	1.82	1.70	.37	1.71	1.81	27.25
1966	2.84	2.24	2.06	1.15	1.15	1.86	2.66	.53	1.12	3.22	1.00	3.17	4.09	25.96
1967	5.37	1.77	3.35	3.12	3.12	2.59	4.18	2.70	.15	1.19	3.57	2.40	5.53	37.01
1968	3.35	2.77	1.28	.99	.99	3.05	3.94	.79	6.28	2.31	1.30	4.22	3.23	34.00
1969	6.40	3.50	.70	1.20	1.20	1.90	3.70	2.00	.60	1.40	1.20	2.50	3.00	29.09
1970	4.80	1.10	4.30	2.20	2.20	.30	4.30	2.50	1.20	2.20	2.80	3.90	4.50	33.99
1971	5.07	2.65	2.34	2.34	2.34	2.07	4.02	1.00	4.02	2.48	1.54	2.42	5.68	35.62
1972	2.81	2.02	2.42	1.47	1.47	2.25	4.29	1.29	2.61	3.97	2.44	2.42	3.09	30.97
1973	2.53	.88	1.92	1.94	1.94	2.97	2.93	2.36	2.03	3.60	1.40	5.01	4.16	31.72
1974	4.04	1.61	7.46	.86	.86	1.97	.59	.55	1.53	1.64	.12	1.14	3.90	25.40
1975	3.56	4.30	4.55	4.08	4.08	1.96	4.59	2.40	2.53	.49	2.58	4.14	3.35	38.58
1976	3.75	2.62	2.45	2.66	2.66	2.33	5.12	1.45	2.40	3.27	2.03	.28	2.22	30.57
1977	2.23	1.15	1.64	.49	.49	4.09	3.50	2.83	3.44	2.63	.75	2.53	5.65	30.92
1978	4.10	3.74	1.17	4.67	4.67	2.15	1.76	2.25	.72	2.13	.23	1.77	2.92	27.61
1979	1.96	3.93	2.45	.57	.57	1.39	1.51	1.02	3.31	1.30	2.20	1.69	.95	22.33
1980	3.25	2.50	1.05	.48	.48	6.20	3.38	2.26	2.82	2.73	.41	1.86	2.79	29.72
1981	1.49	2.30	1.37	1.55	1.55	4.19	3.29	1.62	.48	1.21	2.97	2.95	3.79	26.99
1982	4.69	1.83	5.72	4.65	4.65	1.82	2.40	2.40	2.22	2.73	2.63	2.49	4.98	39.56
1983	1.92	4.07	4.02	1.09	1.09	1.07	4.59	2.40	2.22	2.73	2.63	2.49	4.98	39.56
MEAN	2.94	2.33	2.42	1.81	1.81	2.50	2.74	1.73	1.63	1.30	1.81	2.27	2.65	26.58
S.D.	1.40	1.15	1.30	.96	.96	1.17	1.35	.92	1.11	1.06	1.06	1.26	1.44	5.69
COEFF. VAR.	.477	.493	.537	.534	.534	.468	.493	.531	.673	.599	.583	.557	.544	.214
PERCENT OF														

TABLE 18
Hebgen Dam Precipitation (1931-1982)

MONTHLY PRECIPITATION													
FILE --	MDPRECE2												
SITE --	HEBGEN DAM												
UNIT --	INCHES												
NOTE --	ANY MONTH WITH ****.## INDICATES NO DATA AVAILABLE												
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
1931	1.21	1.50	1.23	.57	1.50	1.52	.92	1.54	1.74	.84	3.20	3.57	19.34
1932	2.55	1.43	5.06	1.60	1.98	3.23	2.42	1.47	.35	1.12	2.91	3.09	27.25
1933	4.48	2.95	.38	1.70	2.24	1.54	.61	2.03	1.28	.94	1.04	4.14	23.87
1934	1.32	.66	2.16	1.04	.16	3.16	.67	.78	1.62	2.15	2.49	2.70	19.53
1935	2.40	.88	3.10	3.69	2.37	1.10	.55	.39	.72	2.70	2.70	1.78	22.38
1936	5.16	2.47	1.11	2.49	1.01	1.82	3.31	2.62	.97	.61	.54	2.82	24.92
1937	3.44	3.56	3.56	2.15	.45	3.91	3.11	.91	1.53	1.41	3.51	3.63	31.22
1938	3.66	4.79	4.37	2.35	3.30	2.81	3.86	1.76	.34	6.22	2.81	2.10	38.86
1939	3.96	2.72	2.22	1.12	1.63	2.21	1.43	.34	1.34	2.35	.08	2.15	21.54
1940	3.18	5.33	3.86	2.99	1.26	2.73	2.16	.06	5.42	1.40	3.27	2.55	34.25
1941	1.54	1.30	1.20	1.02	4.01	3.61	2.38	2.60	3.34	1.39	3.91	2.79	29.18
1942	2.68	1.99	1.02	2.01	4.28	1.36	.35	.44	.71	1.77	3.92	3.29	23.32
1943	2.75	2.04	2.36	2.89	2.73	3.96	1.75	.86	.75	3.57	.78	1.27	25.70
1944	.56	3.02	2.34	.92	2.85	5.98	1.16	.32	1.42	.53	2.91	1.34	23.44
1945	1.15	2.16	1.47	1.15	4.30	4.94	.54	2.85	3.02	.56	3.48	3.38	29.00
1946	2.53	2.97	4.54	.75	2.42	.67	1.54	.89	1.16	3.71	3.57	2.73	27.47
1947	1.92	1.50	1.77	1.10	2.15	4.55	1.08	1.15	3.17	2.46	4.80	1.67	27.31
1948	2.81	1.49	2.26	2.36	2.57	3.16	.96	1.20	1.58	.90	4.26	3.78	27.42
1949	3.03	3.17	.73	.87	2.50	2.55	.69	.85	1.52	1.89	1.97	3.13	22.79
1950	2.52	2.20	3.36	.95	1.24	2.01	2.12	1.28	1.07	2.53	1.74	1.79	22.90
1951	1.39	2.64	2.61	1.05	2.36	2.17	1.43	4.62	.13	3.25	2.17	5.59	29.91
1952	4.42	2.72	3.01	.31	2.09	3.52	1.92	.65	.84	0.00	.75	2.90	23.12
1953	3.97	2.67	1.95	1.44	5.88	2.40	.30	.67	.55	.11	2.14	2.93	25.00
1954	3.44	1.54	1.48	1.95	.74	5.35	1.65	1.34	.50	.40	.92	1.91	21.21
1955	2.46	2.13	1.57	.95	3.16	2.96	2.17	.66	.98	1.99	2.29	4.63	25.90
1956	3.21	2.00	1.22	1.78	2.87	.88	1.85	.77	1.71	4.03	1.64	2.44	24.39
1957	3.19	2.04	1.75	2.53	3.06	2.34	1.86	1.40	.35	2.38	1.53	2.77	25.34
1958	1.28	1.93	3.36	2.60	2.09	3.54	1.90	1.64	1.83	.65	2.28	2.00	25.09
1959	2.64	3.63	3.35	1.17	5.02	4.07	.58	.77	3.04	2.24	1.31	.96	29.83
1960	2.42	2.85	2.19	2.70	2.32	1.33	.51	2.48	.50	2.65	3.46	2.31	25.72
1961	.66	4.36	2.89	1.62	1.91	.96	2.24	4.50	4.26	3.61	2.74	3.30	33.04
1962	3.01	4.25	3.15	1.22	4.77	2.24	1.55	1.39	1.46	1.28	3.24	.90	28.45
1963	3.73	2.49	1.97	3.58	2.72	6.11	.54	.51	4.11	1.78	3.53	2.12	33.18
1964	3.44	2.36	4.00	2.93	2.44	7.50	1.12	1.88	.31	1.91	3.02	7.10	38.05
1965	6.72	1.17	.52	4.50	2.27	3.15	1.42	1.82	1.70	.37	1.71	1.81	27.25
1966	2.84	2.26	2.06	1.15	1.96	2.66	.53	1.12	3.22	1.00	3.17	4.09	25.96
1967	5.87	1.77	3.95	3.12	2.59	4.13	2.70	.15	1.13	3.57	2.40	5.53	37.01
1968	3.85	2.77	1.23	.99	3.05	3.94	.79	6.29	2.31	1.30	4.22	3.23	34.00
1969	6.40	3.50	.70	1.20	1.90	3.70	2.00	.60	1.40	1.20	2.50	3.00	28.09
1970	4.80	1.10	4.30	2.20	.30	4.30	2.50	1.20	2.20	2.80	3.80	4.50	33.99
1971	5.07	2.65	2.34	2.34	2.07	4.02	1.00	4.02	2.48	1.54	2.42	5.68	35.62
1972	2.81	2.02	2.42	1.47	2.25	4.29	1.29	2.61	3.87	2.44	2.42	3.09	30.97
1973	2.53	.88	1.92	1.94	2.97	2.93	2.36	2.03	3.50	1.40	5.01	4.15	31.72
1974	4.04	1.61	7.46	.86	1.97	.59	.55	1.53	1.64	.12	1.14	3.90	25.40
1975	3.66	4.30	4.55	4.03	1.96	4.59	2.40	.49	.49	2.58	4.14	3.35	38.58
1976	3.75	2.62	2.45	2.65	2.33	5.12	1.45	2.40	3.27	2.03	.28	2.22	30.57
1977	2.23	1.15	1.64	.49	4.09	3.50	2.83	3.44	2.63	.75	2.53	5.65	30.92
1978	4.10	3.74	1.17	4.67	1.17	1.76	2.25	.72	2.13	.23	1.77	2.92	27.51
1979	1.96	3.99	2.45	.57	1.39	1.51	1.02	3.31	1.30	2.20	1.69	.95	22.33
1980	3.25	2.50	1.05	.43	6.20	3.38	2.26	2.82	2.73	.41	1.86	2.79	29.72

TABLE 18 Continued

MONTHLY PRECIPITATION

TABLE 19
Hebgen Dam Precipitation
(1935-82)

MONTHLY PRECIPITATION													
FILE -- HDPRECE3													
SITE -- HEBGEN DAM													
UNIT -- INCHES													
NOTE -- ANY MONTH WITH 999.99 INDICATES NO DATA AVAILABLE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
1935	2.40	.83	3.10	3.69	2.37	1.10	.55	.39	.72	2.70	2.70	1.78	22.38
1936	5.16	2.47	1.11	2.49	1.01	1.82	3.31	2.62	.97	.61	.54	2.82	24.92
1937	3.44	3.56	3.56	2.16	.45	3.91	3.11	.91	1.53	1.41	3.51	3.68	31.22
1938	3.66	4.73	4.87	2.35	3.30	2.81	3.96	1.76	.34	6.22	2.81	2.10	39.46
1939	3.36	2.72	2.22	1.12	1.63	2.21	1.43	.34	1.34	2.35	.08	2.15	21.54
1940	3.18	5.33	3.96	2.99	1.26	2.73	2.16	.06	5.42	1.40	3.27	2.55	34.25
1941	1.64	1.30	1.20	1.02	4.01	3.61	2.38	2.60	3.34	1.39	3.91	2.79	29.18
1942	2.69	1.99	1.02	2.01	4.28	1.36	.35	.46	.71	1.77	3.32	3.29	23.82
1943	2.75	2.04	2.73	2.89	2.73	3.96	1.75	.86	3.57	3.57	.78	1.27	25.70
1944	.66	3.02	2.34	.92	2.85	5.93	1.16	.32	1.42	.53	2.91	1.34	23.44
1945	1.15	2.15	1.47	1.15	4.30	4.94	.54	2.85	3.02	.56	3.48	3.38	29.00
1946	2.53	2.97	4.54	.75	2.42	.67	1.54	.99	1.16	3.71	3.57	2.73	27.47
1947	1.92	1.50	1.77	1.10	2.15	4.55	1.08	1.15	3.17	2.45	4.90	1.67	27.31
1948	2.81	1.43	2.26	2.36	2.57	3.16	.96	1.20	1.58	.90	4.26	3.78	27.42
1949	3.03	3.17	.73	.87	2.50	2.55	.59	.85	1.52	1.89	1.37	3.13	22.79
1950	2.52	2.20	3.36	.95	1.24	2.01	2.12	1.23	1.07	2.53	1.74	1.79	22.90
1951	1.39	2.54	2.61	1.05	2.36	2.17	1.43	4.62	.13	3.25	2.17	5.59	29.91
1952	4.42	2.72	3.01	.31	2.09	3.52	1.32	.65	.34	0.00	.75	2.90	23.12
1953	3.37	2.67	1.95	1.44	5.33	2.40	.30	.67	.55	.11	2.14	2.93	25.00
1954	3.44	1.54	1.43	1.95	.74	5.35	1.65	1.34	.50	.40	.92	1.91	21.21
1955	2.46	2.18	1.57	.95	3.16	2.96	2.17	.66	.88	1.39	2.29	4.63	25.90
1956	3.21	2.00	1.22	1.79	2.37	.83	1.35	.77	1.71	4.03	1.54	2.44	24.39
1957	3.19	2.04	1.75	2.53	3.06	2.34	1.36	1.40	.35	2.33	1.63	2.77	25.34
1958	1.28	1.93	3.36	2.60	2.09	3.54	1.90	1.64	1.33	.65	2.28	2.00	25.09
1959	2.64	3.69	3.35	1.17	4.02	4.07	.53	.77	3.04	2.24	1.31	.96	29.33
1960	2.42	2.85	2.19	2.70	2.32	1.33	.51	2.43	.50	2.65	3.46	2.31	25.72
1961	.66	4.36	2.89	1.62	1.91	.95	2.24	4.50	4.26	3.61	2.74	3.30	33.04
1962	3.01	4.25	3.15	1.22	4.77	2.24	1.55	1.39	1.46	1.23	3.24	.90	28.45
1963	3.73	2.49	1.97	3.58	2.72	6.11	.54	1.83	.31	1.91	3.02	2.12	33.18
1964	3.64	2.35	4.00	2.98	2.44	7.50	1.12	1.83	.31	1.91	3.02	7.19	33.05
1965	6.72	1.17	.62	4.50	2.27	3.15	1.42	1.82	1.70	.37	1.71	4.09	27.25
1966	2.94	2.26	2.06	1.15	1.36	2.55	.53	1.12	3.22	1.00	3.17	4.09	25.96
1967	5.37	1.77	3.95	3.12	2.59	4.13	2.70	.15	1.19	3.57	2.40	5.53	37.01
1968	3.35	2.77	1.28	.99	3.05	3.34	.79	6.24	2.31	1.30	4.22	3.23	34.00
1969	6.40	3.50	.70	1.20	1.90	3.70	2.00	.60	2.40	1.20	2.50	3.00	28.09
1970	4.80	1.10	4.30	2.20	.30	4.30	2.50	1.20	2.20	2.80	3.30	4.50	33.99
1971	5.07	2.65	2.34	2.34	2.07	4.02	1.00	4.02	2.48	1.54	2.42	5.68	35.62
1972	2.81	2.02	2.42	1.47	2.25	4.29	1.29	2.61	3.37	2.44	2.42	3.09	30.77
1973	2.53	.89	1.92	1.94	2.37	2.93	2.36	3.50	3.50	1.40	5.01	4.16	31.72
1974	4.04	1.61	7.46	.86	1.37	.59	.55	1.53	1.64	.12	1.14	3.90	25.40
1975	3.66	4.30	4.55	4.03	1.36	4.59	2.40	2.59	.49	2.58	4.14	3.35	39.58
1976	3.75	2.62	2.45	2.66	2.33	5.12	1.45	2.40	3.27	2.03	.28	2.22	30.57
1977	2.23	1.15	1.64	.49	4.09	3.50	2.93	3.44	2.63	.75	2.53	5.65	30.92
1978	4.10	3.74	1.17	4.67	2.15	1.76	2.25	.72	2.13	.23	1.77	2.92	27.61
1979	1.96	3.99	2.45	.57	1.39	1.51	1.32	3.31	1.30	2.20	1.69	.95	22.33
1980	3.25	2.50	1.05	.43	6.20	3.33	2.26	2.92	2.73	.41	1.86	2.79	27.72
1981	1.49	2.30	1.37	1.55	4.18	3.29	1.42	.48	1.21	2.97	2.95	3.79	26.99
1982	4.69	1.33	6.72	4.66	1.82	2.40	2.40	2.22	2.73	2.63	2.49	4.98	39.56
MEAN	3.19	2.53	2.55	1.95	2.54	3.15	1.62	1.69	1.84	1.97	2.53	3.07	28.69

TABLE 19 Continued
Hebgen Dam Precipitation
(1935-82)

MONTHLY PRECIPITATION										
FILE	--	MDRCEJ								
SITE	--	HEBGEN DAM								
UNIT	--	INCHES								
NOTE	--	ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE								
S.D.	1.33	1.03	1.46	1.14	1.50	1.32	1.23	1.25	1.17	1.37
COEF. VAR.	.418	.409	.571	.589	.474	.521	.666	.573	.463	.447
PERCENT OF ANNUAL MEAN	11.1%	8.8%	3.3%	6.8%	11.0%	5.5%	6.4%	6.5%	8.8%	10.7%
SUM OF MONTHLY MEANS	28.7									

TABLE 20
Hebgen Dam Precipitation
(1937-82)

MONTHLY PRECIPITATION													
FILE -- HOPRECEL													
SITE -- HEBGEN DAM													
UNIT -- INCHES													
NOTE -- ANY MONTH WITH ****.00 INDICATES NO DATA AVAILABLE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
1937	3.44	3.55	3.56	2.15	.45	3.91	3.11	.91	1.53	1.41	3.51	3.69	31.22
1938	3.56	4.79	4.97	2.35	3.30	2.81	3.76	1.76	.34	6.22	2.81	2.10	38.86
1939	3.96	2.72	2.22	1.12	1.63	2.21	1.43	.34	1.34	2.35	.08	2.15	21.54
1940	3.18	5.33	3.86	2.99	1.26	2.73	2.16	.05	5.42	1.40	3.27	2.55	34.25
1941	1.54	1.30	1.20	1.02	4.01	3.61	2.38	2.60	3.34	1.39	3.91	2.79	29.18
1942	2.58	1.99	1.02	2.01	4.28	1.36	.35	.44	.71	1.77	3.92	3.23	23.82
1943	2.75	2.04	2.36	2.89	2.73	3.96	1.75	.85	.75	3.57	.78	1.27	25.70
1944	.56	3.02	2.34	.92	2.85	5.93	1.16	.32	1.42	.53	2.91	1.34	23.44
1945	1.15	2.16	1.47	1.15	4.30	4.94	.54	2.85	3.02	.55	3.48	3.38	29.00
1946	2.53	2.97	4.54	.75	2.42	.67	1.54	.89	1.16	3.71	3.57	2.73	27.47
1947	1.92	1.50	1.77	1.10	2.15	4.55	1.98	1.15	3.17	2.46	4.20	1.67	27.31
1948	2.81	1.49	2.26	2.36	2.57	3.16	.96	1.20	1.63	.70	4.26	3.73	27.42
1949	3.03	3.17	.73	.87	2.50	2.55	.69	.85	1.52	1.89	1.87	3.13	22.79
1950	2.52	2.20	3.36	.95	1.24	2.01	2.12	1.23	1.07	2.53	1.74	1.73	22.90
1951	1.39	2.54	2.61	1.05	2.36	2.17	1.43	4.62	.13	3.25	2.17	5.53	29.91
1952	4.42	2.72	3.01	.31	2.09	3.52	1.22	.65	.84	0.00	.75	2.70	23.12
1953	3.97	2.67	1.95	1.44	5.33	2.40	.30	.67	.55	.11	2.14	2.93	25.00
1954	3.44	1.54	1.43	1.95	.74	5.35	1.65	1.34	.50	.40	.92	1.91	21.21
1955	2.46	2.19	1.57	.95	3.15	2.95	2.17	.65	.33	1.20	2.29	4.63	25.30
1956	3.21	2.00	1.22	1.73	2.87	.33	1.35	.77	1.71	4.03	1.54	2.44	24.39
1957	3.19	2.04	1.75	2.53	3.06	2.34	1.35	1.40	.35	2.33	1.63	2.77	25.34
1958	1.28	1.93	3.16	2.60	2.19	3.54	1.70	1.54	1.93	.65	2.28	2.90	25.09
1959	2.64	3.63	3.35	1.17	6.02	4.07	.58	.77	3.04	2.24	1.31	.95	29.33
1960	2.42	2.36	2.19	2.70	2.70	1.33	.51	2.43	.50	2.65	3.46	2.31	25.72
1961	.65	4.36	2.39	1.62	1.71	.95	2.24	4.50	4.26	3.61	2.74	3.20	33.94
1962	3.01	4.25	3.15	1.22	4.77	2.24	1.55	1.39	1.46	1.28	3.24	.90	28.45
1963	3.73	2.49	1.97	3.58	2.72	6.11	.34	.51	1.11	1.73	3.53	2.12	33.18
1964	3.44	2.36	4.00	2.93	2.14	7.50	1.12	1.03	.31	1.91	3.02	7.10	23.05
1965	6.72	1.17	.62	4.50	2.27	3.15	1.42	1.22	1.70	.37	1.71	1.81	27.25
1966	2.34	2.26	2.05	1.15	1.36	2.66	.53	1.12	3.22	1.00	3.17	4.09	25.26
1967	5.37	1.77	3.95	3.12	2.59	4.19	2.70	.13	1.19	3.57	2.40	5.53	37.01
1968	3.95	2.77	1.28	.99	1.05	3.24	.79	6.23	2.31	1.30	4.22	3.23	34.00
1969	6.40	3.50	.70	1.20	1.00	3.70	2.00	.60	1.40	1.20	2.50	3.00	23.09
1970	4.30	1.10	4.30	2.20	1.70	4.30	2.50	1.20	2.20	1.20	2.50	3.00	33.39
1971	5.07	2.65	2.34	2.34	2.27	4.02	1.00	4.02	2.43	1.54	2.42	5.69	35.42
1972	2.81	2.02	2.42	1.47	2.25	4.29	1.29	2.61	3.87	2.44	2.42	3.09	33.37
1973	2.53	.39	1.92	1.94	2.97	2.93	2.36	2.03	3.60	1.40	5.01	4.16	31.72
1974	4.04	1.61	7.46	.85	1.97	.59	.55	1.53	1.64	.12	1.14	3.70	25.40
1975	3.66	4.30	4.55	4.08	1.96	4.59	2.40	2.59	.49	2.59	6.14	3.35	39.58
1976	3.75	2.62	2.45	2.66	2.33	5.12	1.45	2.40	3.27	2.03	.28	2.22	30.57
1977	2.23	1.15	1.64	.49	4.09	3.50	2.83	3.44	2.53	.75	2.53	5.65	30.32
1978	4.10	3.74	1.17	4.67	2.15	1.76	2.25	.72	2.13	.23	1.77	2.92	27.61
1979	1.26	3.93	2.45	.57	1.39	1.51	1.02	3.31	1.30	2.20	1.59	.95	22.33
1980	3.25	2.50	1.95	.43	6.20	3.38	2.26	2.82	2.73	.41	1.96	2.79	29.72
1981	1.49	2.30	1.37	1.55	4.19	3.29	1.42	.43	1.21	2.97	2.95	3.79	26.99
1982	4.69	1.83	4.72	4.66	1.92	2.40	2.40	2.22	2.73	2.63	2.49	4.98	39.56
MEAN	3.17	2.55	2.57	1.90	2.68	3.24	1.50	1.69	1.89	1.83	2.57	3.11	23.71
S.D.	1.32	1.02	1.47	1.14	1.31	.81	1.16	1.33	1.24	1.26	1.16	1.39	4.93
COEFF. VAR.	.419	.400	.572	.600	.499	.459	.504	.793	.655	.674	.451	.447	.170

Table 20 Continued
Hebgen Dam Precipitation
(1937-82)

MONTHLY PRECIPITATION							
FILE --	HOPRECEI						
SITE --	HEBGEN DAM						
UNIT --	INCHES						
NOTE --	ANY MONTH WITH 500.00 INDICATES NO DATA AVAILABLE						
PERCENT OF							11/16/83
ANNUAL MEAN	11.0%	8.9%	3.3%	6.6%	9.3%	5.6%	5.9%
						6.5%	8.9%
							10.8%
SUM OF MONTHLY MEANS							23.9

TABLE 21

Bozeman Precipitation (Historic Period of Record)

MONTHLY PRECIPITATION

FILE -- BOZPRECP	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
SITE -- BOZEMAN														
UNIT -- INCHES														
NOTE -- ANY MONTH WITH ****.## INDICATES NO DATA AVAILABLE														
														11/02/83
1899****.##	1899	****.##	****.##	****.##	****.##	****.##	****.##	****.##	****.##	****.##	****.##	****.##	****.##	****.##
1900	1900	.11	1.60	.39	3.24	2.51	.39	1.32	.63	1.24	1.63	.49	1.35	14.18
1901	1901	.80	.55	1.21	1.29	5.01	1.56	.12	.64	2.03	.09	.05	.52	14.18
1902	1902	.41	.66	.77	1.21	3.90	2.60	.37	1.13	2.07	.30	1.11	1.46	15.49
1903	1903	.78	.33	.67	3.42	2.58	2.45	2.76	.50	1.11	.64	1.52	.73	15.76
1904	1904	.85	2.55	2.98	1.35	2.02	1.74	1.11	.85	.06	.54	.37	.78	17.64
1905	1905	.23	.75	.77	.80	3.23	2.62	1.30	1.21	1.48	1.13	1.70	2.03	16.49
1906	1906	.74	.75	.92	1.61	2.34	3.39	.47	1.80	1.38	1.35	.43	.38	14.58
1907	1907	.93	.80	1.86	.59	3.16	3.79	2.46	1.37	.41	1.08	.36	.42	17.23
1908	1908	.52	1.27	1.40	1.36	9.54	4.57	.32	1.09	1.72	1.97	.35	.36	24.46
1909	1909	.72	.35	1.42	1.82	4.15	1.04	1.38	1.29	5.54	.77	2.36	.90	22.34
1910	1910	.82	.82	.62	1.86	2.72	1.35	.73	1.45	3.51	2.74	1.70	.41	18.74
1911	1911	1.77	.33	.05	1.57	3.56	3.04	.34	1.52	1.73	2.08	1.00	.65	18.14
1912	1912	.92	.39	1.86	3.59	2.66	2.69	1.91	1.63	1.66	3.23	.37	.74	21.64
1913	1913	.78	.47	.44	1.65	2.53	3.13	2.17	.90	2.00	3.15	1.24	.15	18.67
1914	1914	.73	.56	.64	2.02	2.05	3.53	1.28	.11	3.33	1.92	.12	.17	16.85
1915	1915	.91	.05	1.95	2.60	3.67	4.44	3.91	.33	3.34	.62	1.38	1.75	24.99
1916	1916	.95	.79	2.04	2.10	2.99	2.33	1.58	1.33	1.39	2.40	1.11	1.64	21.18
1917	1917	1.87	1.01	.91	1.72	2.37	2.46	.36	.53	2.64	.42	.31	1.13	15.68
1918	1918	1.98	.81	1.24	1.35	2.82	2.70	1.72	.79	2.43	1.05	1.71	.29	18.98
1919	1919	.51	.78	.65	.96	2.10	.09	.36	.97	.87	1.81	.59	1.33	11.02
1920	1920	.32	.51	2.02	2.41	3.33	3.58	1.21	1.05	.83	1.71	1.07	1.21	19.24
1921	1921	1.01	.40	1.82	1.34	2.50	1.34	2.25	.33	1.26	.29	1.08	1.52	15.19
1922	1922	.60	.72	.80	1.67	2.85	2.86	2.49	1.60	.95	.93	1.47	.80	17.74
1923	1923	.25	.49	.28	.73	4.09	3.44	1.53	1.17	.92	1.34	.29	.74	15.27
1924	1924	1.82	1.45	1.71	2.82	1.90	1.46	1.95	.20	2.99	1.82	2.37	.54	20.93
1925	1925	.49	.41	1.32	2.54	1.26	2.30	2.22	1.30	3.08	1.99	.72	1.78	19.40
1926	1926	.48	1.40	.56	.35	4.82	1.59	.94	1.98	3.14	1.03	1.65	1.88	19.92
1927	1927	.75	.99	.78	1.93	5.06	1.46	2.53	1.98	1.12	1.40	2.59	.94	21.83
1928	1928	1.51	1.04	1.30	1.23	1.16	3.80	.81	1.67	.48	1.53	.54	1.17	16.17
1929	1929	1.54	.75	1.26	1.11	1.38	2.84	1.42	.54	.87	1.63	1.00	.83	15.77
1930	1930	.35	.40	.75	1.28	.72	.85	1.64	2.31	1.05	3.41	.97	.62	14.35
1931	1931	1.10	1.13	1.37	1.21	2.23	1.50	1.46	.37	2.13	.81	1.19	.79	15.29
1932	1932	1.02	.31	2.25	2.56	.69	3.23	1.55	1.54	.21	2.23	1.13	.55	17.34
1933	1933	.77	.66	.96	1.37	2.56	1.13	.40	3.48	1.97	1.78	.34	.57	15.39
1934	1934	.47	.71	1.33	.88	.19	2.35	.40	.07	1.06	1.47	.32	1.29	10.54
1935	1935	.75	.29	3.24	1.92	2.35	1.76	.77	.70	.15	2.35	.67	.51	15.46
1936	1936	1.19	1.25	.67	.93	1.31	2.13	.09	1.48	1.04	.74	.66	1.29	12.78
1937	1937	1.54	1.15	1.27	2.42	.32	3.90	2.16	.20	2.33	.51	.67	.92	17.99
1938	1938	.38	.46	3.23	1.55	5.63	1.82	1.20	.88	.09	3.10	1.89	.14	20.34
1939	1939	.74	.52	1.02	.93	1.91	3.71	.69	.94	1.29	1.17	.05	1.00	14.03
1940	1940	1.48	1.22	1.28	3.33	1.38	2.99	.61	.45	2.48	1.05	1.25	1.11	18.63
1941	1941	.20	.44	.78	3.50	1.45	3.17	1.26	1.80	4.60	1.17	2.74	1.76	22.96
1942	1942	2.15	1.71	1.48	.79	2.44	2.68	.47	.53	1.54	1.22	1.78	.45	17.24
1943	1943	.88	.32	1.07	3.07	2.10	2.50	1.90	1.24	.91	1.95	.74	.59	17.21
1944	1944	.12	.73	.96	.60	3.00	7.93	1.70	1.42	2.13	.97	.73	.59	20.92
1945	1945	.36	.47	1.15	1.15	3.67	4.10	.76	1.73	1.84	1.15	1.18	1.97	19.53
1946	1946	1.26	1.13	2.36	1.43	3.03	1.38	1.47	.75	1.97	2.35	.85	.59	18.58
1947	1947	.83	.44	3.02	1.33	1.05	6.78	.37	.80	4.58	.69	3.25	1.35	24.53
1948	1948	1.11	.65	.89	2.04	2.37	4.87	1.58	1.91	.60	.52	1.53	1.43	19.50

TABLE 21 Continued

MONTHLY PRECIPITATION

FILE	--	BOZPRECP
SITE	--	BOZEMAN
UNIT	--	INCHES
NOTE	--	ANY MONTH

INDICATES NO DATA AVAILABLE

11/02/83

[illegible]

SUM OF MONTHLY MEANS

18.2

TABLE 22
Yellowstone Park Precipitation
(Historic Period of Record)

MONTHLY PRECIPITATION													
FILE --	YESTDPR												
SITE --	YELLOWSTONE PARK												
UNIT --	INCHES												
NOTE --	ANY MONTH WITH ##### INDICATES NO DATA AVAILABLE												
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
1887	7.70	4.65	.55	1.40	.25	#####	#####	#####	#####	#####	#####	2.41	#####
1888	3.93	2.02	3.12	.48	#####	#####	#####	#####	#####	#####	#####	8.89	#####
1889	1.05	1.93	.53	.92	1.40	.66	.56	.64	.59	1.32	2.19	.89	20.68
1890	6.70	6.65	4.32	1.39	2.00	.94	.99	1.77	1.74	1.68	.49	.89	28.60
1891	.48	2.79	2.41	.18	2.12	3.05	3.15	1.22	1.74	1.44	2.00	2.77	23.34
1892	1.40	2.10	3.05	.92	2.06	1.46	.98	1.64	1.60	1.34	2.51	1.91	15.18
1893	1.82	.79	.36	.97	1.01	.38	.99	1.06	1.44	1.34	.15	1.34	19.30
1894	1.82	1.12	2.30	1.87	2.26	3.10	.99	1.75	.71	.89	1.30	1.23	17.55
1895	4.76	.34	2.70	.61	1.68	2.71	.57	.72	.43	.44	1.30	1.23	17.55
1896	2.21	2.07	2.62	1.29	3.85	.73	2.09	.37	1.10	.06	3.92	.46	20.76
1897	1.12	.80	1.06	1.21	1.55	2.34	1.11	.57	.31	1.72	2.98	.80	15.57
1898	.31	1.21	1.40	.95	1.95	2.67	1.15	2.05	.90	2.25	1.55	.67	17.06
1899	4.21	3.40	3.00	2.30	2.52	1.90	1.42	2.23	.90	2.02	.03	1.89	25.81
1900	.90	1.65	3.13	1.93	2.42	1.17	.80	.29	.87	1.22	1.17	1.17	16.72
1901	2.26	.72	1.46	1.03	2.72	1.43	.92	1.65	2.85	.92	1.25	2.53	19.79
1902	.96	.61	2.46	2.14	1.59	1.87	2.29	.61	.90	.20	2.35	.85	16.33
1903	.60	.25	.85	.80	.65	.90	.55	.45	.60	.52	1.40	.40	7.96
1904	.93	1.50	2.98	.96	1.31	1.03	1.11	1.11	.73	.67	.18	1.19	13.70
1905	.25	.60	1.41	1.52	2.46	3.05	1.38	.32	1.17	1.42	1.21	.19	14.98
1906	1.48	1.84	1.35	1.24	2.01	.91	.64	1.47	.62	1.07	.63	1.84	15.10
1907	2.44	.58	4.56	1.12	2.16	2.91	2.20	.90	1.19	.54	.91	.94	20.34
1908	.85	1.22	1.39	.89	3.38	3.30	.73	3.42	.74	3.00	.25	.48	13.63
1909	1.61	.65	.77	.81	.35	.75	1.85	.70	2.45	.34	1.16	1.27	13.31
1910	1.90	1.61	.82	1.19	2.34	.61	1.72	.52	.78	1.49	1.53	.88	15.39
1911	4.56	1.10	.95	1.40	2.19	2.20	.97	.66	1.11	1.17	2.33	1.01	13.55
1912	.89	.48	2.57	2.24	2.17	1.21	2.37	1.66	1.09	2.85	1.28	1.47	20.27
1913	2.60	.52	2.00	1.21	2.81	2.09	3.14	1.58	1.34	1.68	1.54	.25	20.76
1914	.97	.78	.56	1.49	1.14	2.48	.36	.20	1.35	1.35	.29	.07	11.74
1915	.41	.39	1.05	1.23	2.33	2.00	1.77	1.53	1.79	.34	1.15	.89	14.34
1916	2.60	.59	1.46	1.05	2.23	2.36	1.34	.70	.71	3.47	.69	2.47	20.27
1917	.69	1.83	1.30	2.64	1.97	.67	.41	.17	1.75	.97	.66	2.28	15.94
1918	1.98	2.03	1.89	1.59	1.95	2.97	2.14	.85	2.11	2.27	.66	.39	20.93
1919	.83	1.64	1.00	1.41	1.29	.14	.80	.25	2.51	2.69	.80	2.13	15.69
1920	.28	1.02	1.95	1.33	2.84	1.18	.65	.87	1.44	1.80	1.13	1.26	15.75
1921	1.49	.62	1.24	1.70	4.48	1.13	.93	1.03	.84	.56	2.55	2.25	19.92
1922	.74	1.84	.66	1.15	1.08	.56	1.45	1.60	.10	.34	.36	1.93	12.46
1923	1.49	.59	1.00	1.81	1.71	2.10	.95	1.05	1.24	1.24	.48	1.46	16.34
1924	.80	.77	1.21	.95	.43	.81	3.39	1.36	1.67	2.43	2.23	1.46	17.50
1925	1.32	1.29	1.00	1.95	2.32	2.82	1.04	1.65	2.73	2.46	.94	.83	20.40
1926	.35	1.05	.56	1.33	2.19	1.19	.18	1.37	1.53	1.42	2.07	.83	14.12
1927	1.10	.86	.65	1.53	2.96	1.02	.42	2.21	2.36	1.53	3.74	1.13	19.56
1928	.70	.37	1.60	1.51	.51	2.99	1.30	.96	.03	1.57	.59	.84	12.77
1929	1.09	.77	1.03	1.48	1.04	1.26	1.21	1.37	1.17	1.27	.86	1.84	14.39
1930	.88	.69	1.10	.62	1.04	1.00	.96	4.13	1.36	2.39	1.11	.27	15.45
1931	.11	.25	.30	.95	1.61	1.27	.72	.75	1.30	.78	1.24	1.14	10.92
1932	.83	.70	1.23	1.05	1.59	2.10	1.09	.97	.47	1.01	.46	.80	12.41
1933	1.19	.76	.54	.91	1.15	1.05	.21	2.53	1.73	.83	.32	1.37	12.64
1934	.61	.24	.36	1.14	.42	3.48	.81	.68	.35	1.00	.56	1.12	11.97
1935	1.00	.49	1.41	2.07	1.31	.46	.52	.72	.55	.80	.77	.22	10.31
1936	1.31	1.60	.71	1.64	.61	1.54	2.00	1.62	.69	.67	.40	1.21	14.90

TABLE 22 Continued

MONTHLY PRECIPITATION

PERCENT OF

—

MONTHLY

FILE -- VESTOPRE
SITE -- YELLOWSTONE PARK
UNIT -- INCHES
NOTE -- ANY MONTH WITH 44

NOTE -- ANY MONTH WITH ##### INDICATES NO DATA AVAILABLE

	8.3%	6.6%	3.6%	7.5%	11.2%	11.8%	7.5%	7.9%	7.7%	7.4%	7.3%	7.6%
ANNUAL MEAN												
SUM OF MONTHLY MEANS												
16.5												

SUM OF MONTHLY MEANS

TABLE 23

PRECIPITATION

TABLE 24
Shower Falls Precipitation
(Historic Period of Record)

PRECIPITATION

FILE -- SFPREC	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	MEAN	S.D.	COEF. VAR.	PERCENT OF ANNUAL MEAN	SUM OF MONTHLY MEANS
SITE -- SHOWER FALLS	1.10	2.10	2.40	3.95	3.95	4.71	4.94	6.23	3.35	4.14	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55
UNIT -- INCHES	2.58	3.02	2.21	8.23	8.23	5.82	5.65	6.23	3.35	4.14	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55
NOTE -- ANY MONTH WITH ##### INDICATES NO DATA AVAILABLE	4.25	3.44	3.44	3.50	3.50	4.22	3.46	6.55	3.35	4.14	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55
YEAR	1.33	5.43	2.94	7.06	7.06	2.24	2.16	5.30	3.35	4.14	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55	4.81	8.55
	6.63	4.10	4.52	7.51	7.51	4.40	7.70	9.10	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24
	4.60	5.37	2.69	5.43	5.43	6.94	7.42	5.60	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36
	3.08	6.21	4.42	5.37	5.37	5.51	7.99	5.10	3.25	4.73	4.73	4.73	4.73	4.73	4.73	4.73	4.73	4.73	4.73	4.73	4.73	4.73	4.73
	3.55	2.25	3.35	2.75	2.75	2.40	6.00	9.50	6.16	6.16	6.16	6.16	6.16	6.16	6.16	6.16	6.16	6.16	6.16	6.16	6.16	6.16	6.16
	3.98	4.29	5.09	4.70	4.70	4.36	7.04	8.21	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94
	3.15	3.22	5.30	7.61	7.61	3.60	6.86	6.41	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14	10.14
	6.10	5.59	5.27	5.08	5.08	3.64	5.09	8.18	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43
	2.90	1.95	3.09	3.87	3.87	3.04	8.16	2.75	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70
	5.85	4.32	6.58	6.00	6.00	4.01	4.19	6.80	9.72	9.72	9.72	9.72	9.72	9.72	9.72	9.72	9.72	9.72	9.72	9.72	9.72	9.72	9.72
	1.40	3.60	5.50	3.30	3.30	4.00	3.70	5.50	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40
	3.20	3.30	3.20	3.40	3.40	3.90	5.80	2.50	8.90	8.90	8.90	8.90	8.90	8.90	8.90	8.90	8.90	8.90	8.90	8.90	8.90	8.90	8.90
	2.90	2.70	2.20	1.80	1.80	3.70	3.50	4.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40
	4.90	3.20	5.20	5.20	5.20	2.70	7.10	6.50	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80
ANNUAL MEAN	4.07	3.81	4.31	4.98	4.98	4.06	5.63	6.03	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31
S.D.	2.06	1.28	1.88	1.84	1.84	1.21	1.82	2.02	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53
COEF. VAR.	.507	.336	.436	.370	.370	.299	.319	.334	.401	.401	.401	.401	.401	.401	.401	.401	.401	.401	.401	.401	.401	.401	.401
PERCENT OF ANNUAL MEAN	7.6%	7.1%	8.0%	9.3%	9.3%	7.6%	10.6%	11.2%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%
SUM OF MONTHLY MEANS																							

53.8

Table 25

Snow Survey Station Index

<u>Station Name</u>	<u>Station Number</u>	<u>Elevation ft, NGVD</u>	<u>SD</u> ^{2/}	<u>Years of Record</u> ^{1/} <u>SWE</u> ^{3/}	<u>Temp</u>	<u>Precip</u>
Arch Falls	10 D 14	7350	21	21		
Devils Slide	10 D 04	8100	49	49		
Hood Meadow	10 D 03	6600	49	49		
Lick Creek	10 D 13	6860	20	20	20	18
Shower Falls	10 D 16	8100	19	19	18	18

Notes:

^{1/} Years of measured record used in the Hydrologic Potential Study.
 Note: Not all years have a complete record.

^{2/} SD = Snow Depth

^{3/} SWE = Snow Water Equivalent

TABLE 26

11/02/83

203-6

TABLE 28

SMITHSONIAN

TABLE 28 Continued
Devils Slide Snow Depth

[illegible]

TABLE 29
Devils Slide Snow Water Equivalent

WATER EQUIVALENT												
FILE -- OSMEODATS	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
SITE -- DEVIL'S SLIDE												
UNIT -- INCHES												
NOTE -- ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE												
	11/02/83											
ANNUAL TOTAL												
1935	12.2	18.4	12.3	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8
1936	18.4	12.3	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2
1937	12.3	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4
1938	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5
1939	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3
1940	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8
1941	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2
1942	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9
1943	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7
1944	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6
1945	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2
1946	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8
1947	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2
1948	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4
1949	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5
1950	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8
1951	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2
1952	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9
1953	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7
1954	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6
1955	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2
1956	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8
1957	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2
1958	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4
1959	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5
1960	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8
1961	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2
1962	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9
1963	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7
1964	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6
1965	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2
1966	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8
1967	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2
1968	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4
1969	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5
1970	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8
1971	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2
1972	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9
1973	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7
1974	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6
1975	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2
1976	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8
1977	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2
1978	20.4	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4
1979	18.5	18.3	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5
1980	23.8	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8
1981	15.2	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2
1982	20.9	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9
1983	18.7	18.6	20.2	21.8	18.2	20.4	18.5	18.3	23.8	15.2	20.9	18.7

TABLE 30

SNOW DEPTH

FILE -- HMSOEP4

SITE -- HOOO MEADOW

UNIT -- INCHES

UNIT MONTH WITH ##### INDICATES NO DATA AVAILABLE

11/02/83

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
1935	+000000.0	+000000.0	26.0	+000000.0	29.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1936	+000000.0	+000000.0	28.0	+000000.0	0.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1937	+000000.0	+000000.0	24.0	+000000.0	29.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1938	+000000.0	+000000.0	27.0	+000000.0	18.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1939	+000000.0	+000000.0	35.0	29.0	7.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1940	+000000.0	+000000.0	27.0	27.0	23.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1941	+000000.0	+000000.0	23.0	16.0	11.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1942	+000000.0	+000000.0	38.0	35.0	19.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1943	+000000.0	+000000.0	39.0	32.0	10.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1944	+000000.0	+000000.0	28.0	41.0	26.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1945	+000000.0	+000000.0	25.0	34.0	26.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1946	+000000.0	+000000.0	34.0	35.0	15.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1947	+000000.0	+000000.0	35.0	40.0	29.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1948	+000000.0	+000000.0	47.0	51.0	41.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1949	+000000.0	+000000.0	38.0	42.0	11.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1950	+000000.0	+000000.0	26.0	33.0	27.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1951	+000000.0	+000000.0	29.0	36.0	24.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1952	+000000.0	+000000.0	47.0	50.0	11.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1953	+000000.0	20.0	29.0	26.0	24.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1954	+000000.0	26.0	25.0	40.0	18.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1955	+000000.0	26.0	30.0	37.0	30.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1956	+000000.0	32.0	35.0	33.0	24.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1957	+000000.0	+000000.0	28.0	31.0	32.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1958	+000000.0	34.0	40.0	39.0	39.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1959	+000000.0	30.0	31.0	40.0	29.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1960	+000000.0	22.0	36.0	31.0	20.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1961	+000000.0	20.0	28.0	23.0	28.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1962	+000000.0	31.0	40.0	42.0	27.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1963	+000000.0	33.0	40.0	35.0	30.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1964	+000000.0	23.0	39.0	46.0	32.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1965	+000000.0	42.0	42.0	51.0	32.0	17.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1966	+000000.0	15.0	23.0	25.0	19.0	0.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1967	+000000.0	29.0	37.0	50.0	42.0	0.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1968	41.0	33.0	38.0	41.0	42.0	2.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1969	21.0	33.0	38.0	32.0	24.0	0.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1970	36.0	39.0	40.0	63.0	64.0	25.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1971	26.0	33.0	35.0	44.0	42.0	2.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1972	20.0	20.0	30.0	30.0	27.0	0.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1973	19.0	27.0	28.0	45.0	52.0	0.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1974	24.0	24.0	30.0	38.0	36.0	20.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1975	25.0	30.0	37.0	51.0	56.0	41.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1976	29.0	29.0	36.0	45.0	51.0	5.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1977	11.0	17.0	25.0	35.0	17.0	0.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1978	22.0	38.0	37.0	29.0	18.0	1.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1979	24.0	30.0	36.0	34.0	32.0	6.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1980	18.0	22.0	30.0	40.0	24.0	17.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1981	4.0	11.0	12.0	18.0	7.0	0.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1982	20.0	21.0	30.0	44.0	39.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0
1983	27.0	19.0	24.0	34.0	26.0	11.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+000000.0	+0000000.0

TABLE 30 Continued
Hood Meadow Snow Depth

[illegible]

TABLE 31
Hood Meadow Snow Water Equivalent

WATER EQUIVALENT												
FILE	--	HMSDMT4										
SITE	--	HOOD MEADOW										
UNIT	--	INCHES										
NOTE	--	ANY MONTH WITH ***** INDICATES NO DATA AVAILABLE										
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
												ANNUAL TOTAL
1935	*****	*****	5.9	*****	7.2	*****	*****	*****	*****	*****	*****	*****
1936	*****	*****	7.4	*****	0.0	*****	*****	*****	*****	*****	*****	*****
1937	*****	*****	6.0	*****	7.8	*****	*****	*****	*****	*****	*****	*****
1938	*****	*****	6.0	*****	4.6	*****	*****	*****	*****	*****	*****	*****
1939	*****	*****	7.8	8.2	2.4	*****	*****	*****	*****	*****	*****	*****
1940	*****	*****	6.7	8.3	8.3	*****	*****	*****	*****	*****	*****	*****
1941	*****	*****	5.2	3.4	3.2	*****	*****	*****	*****	*****	*****	*****
1942	*****	*****	8.4	10.2	5.5	*****	*****	*****	*****	*****	*****	*****
1943	*****	*****	9.7	9.9	3.5	*****	*****	*****	*****	*****	*****	*****
1944	*****	*****	6.8	9.3	7.4	*****	*****	*****	*****	*****	*****	*****
1945	*****	*****	5.0	7.2	6.9	*****	*****	*****	*****	*****	*****	*****
1946	*****	*****	8.4	10.4	4.6	*****	*****	*****	*****	*****	*****	*****
1947	*****	*****	7.3	12.5	10.3	*****	*****	*****	*****	*****	*****	*****
1948	*****	*****	12.6	14.9	14.1	*****	*****	*****	*****	*****	*****	*****
1949	*****	*****	9.4	12.7	3.3	*****	*****	*****	*****	*****	*****	*****
1950	*****	*****	5.2	8.6	9.7	*****	*****	*****	*****	*****	*****	*****
1951	*****	*****	7.8	10.9	8.0	*****	*****	*****	*****	*****	*****	*****
1952	*****	*****	11.8	15.8	3.9	*****	*****	*****	*****	*****	*****	*****
1953	*****	3.9	7.3	8.9	8.0	*****	*****	*****	*****	*****	*****	*****
1954	*****	5.4	6.5	10.5	5.9	*****	*****	*****	*****	*****	*****	*****
1955	*****	3.9	7.4	10.4	11.9	*****	*****	*****	*****	*****	*****	*****
1956	*****	7.1	8.4	10.7	8.3	*****	*****	*****	*****	*****	*****	*****
1957	*****	*****	6.9	9.6	7.6	*****	*****	*****	*****	*****	*****	*****
1958	*****	9.1	9.5	10.5	11.4	*****	*****	*****	*****	*****	*****	*****
1959	*****	7.3	9.0	12.5	10.5	*****	*****	*****	*****	*****	*****	*****
1960	*****	4.8	7.9	8.7	7.1	*****	*****	*****	*****	*****	*****	*****
1961	*****	4.9	6.9	8.4	8.4	*****	*****	*****	*****	*****	*****	*****
1962	*****	8.7	10.4	12.5	7.2	*****	*****	*****	*****	*****	*****	*****
1963	*****	9.6	10.5	10.4	10.7	*****	*****	*****	*****	*****	*****	*****
1964	*****	5.2	9.3	13.3	12.7	*****	*****	*****	*****	*****	*****	*****
1965	*****	3.6	12.7	14.9	12.3	7.0	*****	*****	*****	*****	*****	*****
1966	*****	3.4	13.6	17.0	7.0	0.0	*****	*****	*****	*****	*****	*****
1967	*****	8.2	11.0	15.0	14.6	0.0	*****	*****	*****	*****	*****	*****
1968	9.5	11.6	12.4	13.3	15.2	0.0	*****	*****	*****	*****	*****	*****
1969	4.6	8.5	9.2	8.2	8.5	0.0	*****	*****	*****	*****	*****	*****
1970	8.2	11.9	12.8	18.8	22.8	10.0	*****	*****	*****	*****	*****	*****
1971	6.4	9.1	11.2	14.7	15.5	7.0	*****	*****	*****	*****	*****	*****
1972	4.6	7.9	9.2	11.0	10.7	0.0	*****	*****	*****	*****	*****	*****
1973	4.7	6.4	7.2	11.3	17.5	0.0	*****	*****	*****	*****	*****	*****
1974	4.7	6.4	8.6	12.4	14.5	7.3	*****	*****	*****	*****	*****	*****
1975	6.2	9.8	11.4	14.2	17.2	17.0	*****	*****	*****	*****	*****	*****
1976	7.5	9.3	11.8	13.3	17.1	2.2	*****	*****	*****	*****	*****	*****
1977	2.2	3.8	4.8	9.7	6.4	0.0	*****	*****	*****	*****	*****	*****
1978	4.8	8.0	10.1	10.4	7.8	0.0	*****	*****	*****	*****	*****	*****
1979	5.2	9.0	9.3	10.3	10.3	1.2	*****	*****	*****	*****	*****	*****
1980	3.6	6.4	8.0	11.3	8.2	1.2	*****	*****	*****	*****	*****	*****
1981	1.1	1.8	3.2	5.4	2.4	0.0	*****	*****	*****	*****	*****	*****
1982	4.4	7.0	9.1	12.4	14.2	*****	*****	*****	*****	*****	*****	*****
1983	4.3	5.2	6.1	8.9	7.8	3.5	*****	*****	*****	*****	*****	*****

11/02/83

TABLE 33

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FILE -- LCSWTRD4
SITE -- LICK CREEK
UNIT -- INCHES
NOTE -- ANY MONTH
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UNIT -- INCHES
NOTE -- ANY MONTH WITH ####.# INDICATES NO DATA AVAILABLE

11/02/83

[illegible]

TABLE 34

SNOW DEPTH

TABLE 37
Probability Levels for Watershed Yield
Hyalite Creek at Middle Creek Dam

MONTHLY STREAMFLOW

% FIRM YIELD

FILE NAME -- HCFINAL
SITE -- MIDDLE CREEK DAM INFLOW
UNIT -- AC-FIT

X	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
90	834	550	576	471	364	463	738	4796	6122	2118	1131	921	22700
80	1046	808	755	597	499	565	1112	5365	7576	3115	1455	1146	27346
70	1134	381	800	655	569	635	1241	5665	9314	3959	1662	1267	29335
60	1250	964	853	705	606	682	1355	6286	9700	4485	1851	1351	30729
50	1406	1025	879	784	663	719	1513	6745	10963	5105	1969	1499	34009
40	1526	1123	931	870	747	918	1715	7328	11218	5329	2127	1626	35934
30	1721	1213	1043	923	776	945	1967	8216	11907	6489	2293	1320	39920
20	1893	1436	1137	989	829	1012	2406	9082	12717	7939	2756	1953	40719
10	2057	1501	1253	1173	932	1061	3025	10165	15282	9517	3297	2443	50097
5	2231	1569	1503	1340	1043	1100	3595	14127	19177	10554	3558	2591	52908
2	2933	1943	1898	1460	1033	1411	5526	14232	20074	18246	4722	3381	56995
1	3242	1854	2096	1470	1038	1582	6576	14254	20868	22406	5301	3805	57439

